No transactions of the first meeting 1864, published in separate form.

[Letter from the Society, November 9, 1936]

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AMERICAN

Ophthalmological Society.

New York, June 13th, 1865.

The American Ophthalmological Society held its second annual meeting at the New York Eye and Ear Infirmary. The President, Dr. Edward Delafield, of New York, took the chair.

The following members were present during the session of the Society:

Dr. Edward Delafield,.....New York.
" C. R. Agnew, "
" Charles M. Allin,..... "
" H. Althof,..... "
" F. J. Bumstead,..... "
" Wm. H. Carmalt,..... .... "
" H. Derby,..... Boston.
" A. Du Bois, ...New York.
" E. Dyer, ...Philadelphia.
" John H. Hinton, ...New York.
" Wm. F. Holcomb, ... "
" B. Joy Jeffries, ...Boston.
" Edward G. Loring, ... "
" T. G. Morton,..... Philadelphia.
" C. A. Robertson,.....Albany.

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Dr. D. B. St. John Roosa,.....New York.
" Henry B. Sands, ... "
" Henry D. Noyes,..... "
" E. Williams,.....Cincinnati.
" Henry W. Williams, ...Boston.

The minutes of the previous meeting, at which the Society was organized, were read and approved.

The following committees were then appointed:

On Election of New Members—Drs. Dyer, Bumstead, Jeffries, E. Williams, and Morton.

On Nomination of Officers—Drs. Derby and Bumstead.

Publication Committee—Drs. Bumstead and Derby, with the Recording Secretary, Dr. Noyes.

The report of the Treasurer was presented and accepted.

A committee was appointed to select a subject for discussion at the next meeting, consisting of Drs. H. W. Williams, E. Williams, and Agnew.

The following paper was then read:

Report on the Progress of Ophthalmology during the past year.

By Dr. B. Joy Jeffries, of Boston.

Your committee has not considered it within its province to enumerate or criticise all that has been said or written upon ophthalmology during the past year, but simply to bring before you what seems truly in advance of our former knowledge, and show its importance in our branch of medical science, and its bearing upon the study and practice of the profession at large.

"Mr. Newton has demonstrated several new propositions, which are so many new truths, and are further advances in mathematical knowledge."—*Locke.*

The results of the labors of Donders and his assistants upon the accommodation and refraction of the human eye which have been given to the scientific world during the year 1864, by means of the "New Sydenham Society,"[1] may properly be called "new propositions, which are so many new truths and further advances" in ophthalmology. As the members of the Society have probably ere this rendered themselves familiar

with the contents of this magnificent volume, embracing the long-continued researches of Donders, it is not necessary, perhaps not even becoming, for your committee to attempt analyzing these studies, already become fixed facts in ophthalmological and optical science. An analysis of these investigations upon the refraction and accommodation of the eye is in reality the book itself. It is, therefore, but left to us to show the bearing of these important truths upon our specialty, and our relation to our medical brethren. They have revolutionized the treatment of anomalies of accommodation and refraction as thoroughly as the invention of the ophthalmoscope revolutionized the treatment of internal affections of the globe. They have, almost like the demonstration of a mathematical problem, not only determined the existence, but the treatment of myopia, hypermetropia, asthenopia and astigmatism. Together with the invention of the ophthalmoscope, the results of this application of the higher mathematics to the solution of problems in physiological optics have served to raise our specialty to a much higher grade in medical science. In speaking of ophthalmoscopic literature, an English reviewer said: "It has been happily observed of a book that once produced much controversy, the 'Vestiges of the Natural History of Creation,' that the most conspicuous fact in connection with its history was the discovery of previously unsuspected strata of ignorance in the so-called intelligent and educated classes. In like manner the introduction of the ophthalmoscope into England was the cause of some sufficiently startling revelations of a similar kind. Many of the leading oculists were found to be unconversant with the elementary facts of optics, and were therefore unable to comprehend the principles upon which the instrument was based, or to speak of it without unconsciously falling into error."—(*Ophthalmic Review*, *April*, 1864, *p.* 90.)

From remarks here and there cropping out in the journals in reference to Donders's book, we fear that there are still deeper "previously unsuspected strata of ignorance among the so-called intelligent and educated" surgeons, and even oculists of our day. Let this not be said of the members of this Society. Our duty to the profession requires us to be ever eager to learn, appreciate, and adopt all advances in ophthalmological science

as well as in ophthalmological medicine and surgery. In this way only can we retain the position which our medical brethren are according us, and which is the surest means of shaking off from our specialty the fungus of quackery springing up from the soil of ignorance. The name of oculist will then no longer be a doubtful term. Already out of the profession comes a call for *scientific* ophthalmologists. A non-medical writer on physiological optics says: "In the ordinary diseases to which the eye, like other parts of the body, is subject, we may safely confide in the skill of the experienced physician; but in the diseases to which it is liable as an optical instrument, where optical science can alone direct us, we regret that professional assistance is difficult to be found. Guided by practice, the skillful oculist may dexterously extract the crystalline lens, or make an artificial pupil; but all the refinements of optical science are requisite in the practitioner to whom we commit the care of our sight; and we trust the time is not distant when men will be expressly educated for this branch of the healing art, and exhaust in their practice the rich resources with which science can supply them."—(*North British Review*, *Nov.*, 1856, *quoted in Jago's Entoptics*, *preface*, *p.* 9.) In reality, ophthalmoscopy and the anomalies of refraction and accommodation are already becoming almost a specialty within a specialty. No better proof is needed than this to show that new truths have been discovered requiring the special energy and study of ophthalmologists. And the year that has passed has given us all opportunity to make ourselves masters of the researches of those who are the leaders in our specialty. In this, then, ophthalmology has truly advanced.

Ophthalmic Photography.—Some advance has been made in the method employed to obtain photographs of the fundus oculi of animals, by Dr. Henry D. Noyes, of New York, Dr. A. M. Roseburgh, of Toronto, Canada, and we believe, also, by Dr. Liebreich. The fundus of the human eye has not yet been photographed, yet we cannot doubt but that it will be done. It has been suggested that the quality of the light has not, perhaps, been sufficiently studied. That is, is there not some form of illumination to which the plate, but not the eye, is particularly

sensitive? The photographist and the physiologist must combine their knowledge and efforts. It will certainly be a great gain to be able to photograph important cases of internal disease of the globe, for now the difficulty and expense of producing a colored lithograph, to represent even faintly morbid changes, is very great, and we all know how impossible it is to intelligibly describe what we see.

Autophthalmoscopy.—The inventions of Prof. Coccius,[2] of Leipsic, Dr. Giraud-Teulon,[3] of Paris, Dr. F. Heyman,[4] of Dresden, and N. W. Zehender,[5] of Bern, have lately "given us the gift to see ourselves as others see us." But the power of viewing one's own optic disk and retinal vessels is not simply a physiological wonder. It gives the ophthalmic student opportunity to study for himself by himself. Indeed, a good method of training himself in ophthalmoscopy is, to become by practice *au fait* at examining his own fundus oculi. He can also thereby learn what to see and how to see it. Although autophthalmoscopy is but in its infancy, yet we already have several different forms of the instrument, both for the upright and inverted image. It would not be safe to predict the results that may be developed by the autophthalmoscope. One thing let us note. It sprung from philosophic ophthalmologists applying the laws of optics to physiology. It was not stumbled on, but wrought out by patient investigation and experiment.

Entoptics.—Prof. Donders's researches, and more especially Dr. James Jago's,[6] have been given to the world during the year 1864. Entoptics is certainly one of the most difficult fields of study, and has consequently been lying fallow for some time. Dr. Jago has not only given us the means of investigation, but the results of these means, when employed. Although the ophthalmoscope, and more especially the binocular, has greatly removed the necessity of entoptical examination, yet Dr. Jago has so enlarged our method of determining the position and importance of ocular spectra that we can now hardly leave out this help to our diagnosis. His investigations certainly give us a series of new truths, and are therefore advances upon our former knowledge, whether they are applied or forgotten, to be again hereafter brought forward, when some additional

discovery throws them out into relief, like these ocula spectra lying unnoticed or hidden till a glimpse through a perforated card calls them up as by the magician's wand.

Retinal Structure.—Heinrich Müller's researches on the structure of the retina in man and the vertebrates, published in 1856, have been the basis of our knowledge on this subject, and his anatomical investigations seemed so firmly fixed that they were considered as absolute. But Dr. Carl Ritter has given us lately his own continuance, as one might say, of Müller's work. He has certainly made a great advance over our former knowledge of the histological elements of the retina; so that Müller's views must be greatly modified. He regrets, with his readers, that Müller's death, just as he was completing his work, took away a critic who could both appreciate and weigh the value of his investigations. Till the anatomy of the retina is exhausted, its physiology must still be in a measure hypothetical. Dr. Ritter's careful deductions and patient research have brought us a long distance in advance of where Müller and those following him left us. These are the histological elements as he gives them: Bacillar layer, granular layer, fibrous layer, ganglion-cell layer, nerve-fibre layer. He has traced the connection of these layers, and more especially shown and explained the supporting structure which holds and sustains them. This clears up a great deal before uncertain, and the anatomy of the retina commences to assume some definite shape. He concludes his work with this paragraph, the deductions from his investigations: "Thus determining the functions of the separate portions of the nervous structure of the retina, the bacillæ simply receive the impression, their stimulation corresponds to the sensation; the granules convert the sensation into nervous stimulation; the granular cells give the sense of color; the ganglion cells finally determine the retina's sense of location. Although I know very well that this is hypothetical, yet I cannot but think that a definite expression of it will be of use." Late optical and physiological studies seem to support these views. We see how far they would carry us towards the true theory of vision. This is not of course the place to criticise them.

Binocular Ophthalmoscope.—We owe to Dr. Giraud-Teulon, and following him, Mr. J. Z. Lawrence, our thanks for the invention of the binocular ophthalmoscope, by means of which we are enabled to save a great deal of time and uncertainty in determining the position of extravasations, exudations, deposits, &c., in the vitreous humor, retina and choroid. It is true, as Dr. Schweigger admits, that with the monocular ophthalmoscope it is possible to ascertain nearly all that the binocular instrument can reveal to us; but a moment's glance with both eyes is worth an hour's gaze with one. Probably in a short time ophthalmologists will use it to the exclusion of the monocular ophthalmoscope. A comparison of the two would be better than any description we can here give. Time will undoubtedly simplify as well as cheapen this instrument. It is, in the highest sense of the term, an advance upon our previous means of observation. Simply as a scientific or philosophical instrument, it will be of great value, as probably enabling us to settle many points in reference to binocular vision and so-called stereoscopic effect. It is a new means of experimenting in this field of physiological optics. Its general use will be looked forward to with interest by both the philosophical and pathological ophthalmologist.

Physiology and Theory of Vision.—Physiologists and philosophical ophthalmologists have, the last few years, given a great deal of time and study to vision, and their labors have been so productive of new truths as to attract the attention of the general scientific world. This has been, perhaps, in great part due to the invention of the ophthalmoscope, and the educated research called forth by it, as it brought again more forcibly before philosophers the human eye as the most attractive field for physiological and psychological study. The published record of investigations for the last ten years are mainly contained in the works which we here enumerate. (Vide note 9.) It is of course impossible to give even a resumé of the results these authors have arrived at. Many optical and physiological experiments, always accepted as absolute, have been disproved or different deductions drawn from them. Others have stood the test of repetition by careful observers, and thus

placed us in advance of our former knowledge. A carefully conducted physiological optical experiment is as it were however but the anatomy, the deduction from it the physiology of vision. Some theories of vision have been again weighed in this recent research, and in this respect the past year has been productive of new truths. Others have not stood the test of crucial experiment, and thus we have likewise gained ground in our difficult field of study. But it may be asked, how has all this laborious experimentation helped us? In what way have we been advanced by it? Our answer would be: From just these studies sprung the ophthalmoscope, the laws of accommodation and refraction, and the true meaning of strabismus.

Mr. Abbott's book, "Sight and Touch," reviews, as it were, the results of the others mentioned, with the purpose of disproving the Berkeleian theory of vision. That is, he has tested this theory by the experiments and laws and reasoning therefrom deduced, in the long series of investigations carried on by physiological ophthalmologists the past few years. The result is, that the eye must be placed much higher among the organs of sense. Through it we gain a greater knowledge of the external world than has hitherto been conceded. The received ideas in reference to stereoscopic effect must be greatly modified. The use of two eyes seems to give us a greater amount, besides a different power, of vision gained by one. There is much we would willingly dwell upon in this book, but it is not perhaps in place here. It is proper to state that Dr. Giraud-Teulon, of Paris, prosecuted similar studies in 1860. Mr. Abbott has reversed the theory that sight was dependent upon touch; and here we have made a great advance, and can proceed upon a sounder basis in optical experiment, which must be, as it were, the anatomy for physiological deduction. "The science of philosophy must henceforth give place to the philosophy of science."

In three great points, then, has ophthalmology advanced, or an advance made sure and proved, during the year. First, in the laws of the refractive media of the eye in health and disease; second, in the anatomy of the membrane, upon which these refractive media form the picture; and thirdly, in the

means by which this retinal impression becomes visual perception. But these three taken together are "*sight*."

The past year has not perhaps been very productive of great improvements in ophthalmic medicine and surgery. Much it is true has been proposed, but time must test its worth, and say whether or no it is more than a revival or another application of former knowledge forgotten. It must be remembered that the old proverb applies to our specialty as well as to other branches of medicine, "There is nothing new that is true, or true that is new."

Yet in the every-day life, so to speak, of ophthalmology, the past year has not left us behind. There was a spirited meeting of the "Ophthalmologische Gesellschaft" in September, and the proceedings were published by Von Græfe, Hess, and Zehender. A new ophthalmic journal, the "Ophthalmic Review," was started in London, and has been kept up with spirit and in the pursuit of scientific truth. The excellent "Reports of the Royal London Ophthalmic Hospital" have also been continued. Zehender's Klinische Monatsblätter and the Annales d'Oculistique contain ever fresh material and useful digests. The "Archiv für Ophthalmologie" has gone steadily on at the head of ophthalmic literature. A number of new and exceedingly valuable works and monographs upon various subjects have appeared from the European press, such as Schweigger's Gebrauch der Augenspiegel,[10] Zander and Geissler's Verletzungen der Augen,[11] Wecker's Études Ophthalmologiques,[13] Carter's translation of Zander on the Ophthalmoscope,[12] J. S. Wells's Lectures on Glaucoma,[14] Canton's Arcus Senilis,[15] and many others.

If, during these times of excitement and anxiety, we American ophthalmologists have not perhaps contributed our share towards the advancement of our science, we shall be pardoned by our medical brethren. We have, at least, by the very formation of this Association, shown that we are anxious to learn, by mutual intercourse and interchange of thought and criticism, and that we ever have in view the one great object of our specialty, the restoration of sight.

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On the Invention of Stereoscopic Glasses for Single Pictures, &c. P. Wharton Jones. London, 1860.

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13. Traité théorique et pratique des Maladies des Yeux, par L. Wecker. Paris, 1862-3-4.

14. Four Lectures on Glaucoma and its Cure by Iridectomy. J. Soelberg Wells. London, 1864.

15. Arcus Senilis, or Fatty Degeneration of the Cornea, by Edwin Canton, F.R.C.S. London, 1863.

After remarks suggested by the bibliographical notes, a motion was made by Dr. Agnew that a committee be appointed, to be styled a Committee on Ophthalmic Bibliography, who shall prepare a catalogue of books, of journals, and of pamphlets relating to ophthalmology. Motion adopted. The following gentlemen were named by the Chair: Drs. Agnew, Jeffries, and Althof.

A paper, written by Dr. Hildreth, of the U. S. Desmarres Hospital, Chicago, was then presented by Dr. Dyer; the subject being

Statement of Cases of Gonorrhœal and Purulent Ophthalmia treated in the Desmarres (U. S. Army) Eye and Ear Hospital, Chicago, Illinois, with Special Report of Treatment Employed. By Surgeon J. S. HILDRETH, U. S. V., in charge of Hospital.

TABULAR STATEMENT *of all Cases of Gonorrhœal and Purulent Ophthalmia treated in the Desmarres Eye and Ear Hospital, at Chicago, Illinois, from August 26th, 1864, to January 15th, 1865, with results obtained.*

No.	Names.	Age.	Affection.	Treatment by Pressure.				Results.			
				With.		Without.		Saved.		Lost.	
				Right.	Left.	Right.	Left.	Right.	Left.	Right.	Left.
1	Chapin	23	Purulent Ophthalmia...	1	1	..	..	1	1	..	..
2	Case	48	" "	1	1	..	..	1	1	..	..
3	Richards	33	" "	1	1	..	..	1	1	..	..
4	Haight	26	" "	..	1	1	..	.	1	1	..
5	Vosburgh	13	" "	1	..	..	1	1	..	..	1
6	Finn	23	" "	1	..	..	1	1	..	..	1
7	Shimming	20	" "	1	..	..	1	1	..	..	1
8	Ulrich	25	" "	1	..	..	1	1	..	..	1
9	Strong	24	" "	..	..	1	1	1	1	..	..
10	Shafer	39	" "	..	..	1	1	..	1	1	..
11	Smith	25	" "	..	..	1	1	1	1	..	..
12	Doran	17	" "	..	..	1	1	..	..	1	1
13	Gibbs	43	" "	..	..	1	1	..	..	1	1
14	Ellsworth	24	Gonorrhœal Ophthalmia.	1	1	..	..	1	..	..	1
15	Essen	40	" "	1	1	..	..	1	1	..	..
16	Mervin	20	" "	..	..	1	1	1	1	..	..

RECAPITULATION.

	No.	Saved.	Lost.
Eyes Treated with Pressure	15	14	1
Eyes Treated without Pressure	17	7	10

The condition of the above cases at the commencement of treatment with pressure was as follows. Results are also given.

CONDITION OF PATIENTS.

No. 1.—Corneæ panniform and ulcerated; chemosis sero-phlegmonous and large; purulent discharge abundant.

Nos. 2 and 3.—Corneal epithelium of both eyes considerably disturbed; chemosis sero-phlegmonous, firm and large; discharge abundant.

RESULTS, &C.

Pressure was used on both eyes in these three cases.

No. 1 recovered in good condition, except nebulous spots at seat of old ulcerations of corneæ, whose panniform condition is fast disappearing and vision improving.

Nos. 2 and 3 recovered in good condition.

CONDITION OF PATIENTS.

No. 4—Right cornea sloughed and lost; left corneal epithelium so disturbed as to seriously interfere with its transparency; chemosis large and phlegmonous.

No. 5—Cornea of left eye sloughed and lost; right corneal epithelium considerably disturbed; chemosis phlegmonous, large and firm.

No. 6—In similar condition.

No. 7—Left cornea sloughed and lost; right affected with central ulceration and perforation; chemosis phlegmonous and very large; great tumefaction of the lids of both eyes.

No 8—Left cornea sloughed and lost; right panniform and ulcerated; chemosis very large, firm and phlegmonous; purulent discharge from all abundant.

RESULTS, &C.

Pressure was employed on left eye of No. 4 and on right eye of Nos. 5, 6, 7 and 8.

Nos. 4, 5 and 6 recovered in good condition; No. 7 with central leucomatous spot, artificial pupil practicable: and No. 8 with cornea cloudy and panniform, but constantly improving.

CONDITION OF PATIENTS.

Nos. 9, 10 and 11—Severe purulent ophthalmia, with large sero-phlegmonous chemosis, (No. 10 being phlegmonous;) purulent discharge abundant, and great tumefaction of lids.

RESULTS, &C.

No pressure was used in these cases.

No. 9 recovered both eyes in good condition. No. 10 lost left eye from sloughing of cornea, the right cornea recovering, panniform and nebulous, but improving. No. 11 recovered with synechia anterior of each eye, from perforation of the corneæ.

CONDITION OF PATIENTS.

Nos. 12 and 13—Severe purulent ophthalmia, accompanied by considerable disturbance of corneal epithelium of both eyes and large sero-phlegmonous chemosis; purulent discharge very abundant; lids greatly tumefied.

RESULTS, &C.

No pressure used, and both eyes lost in each case from sloughing of the corneæ.

CONDITION OF PATIENT.

No. 14—Cornea of left eye largely infiltrated in its deep "laminæ:" very large and firm chemosis; lids largely tumefied and eye scarcely influenced by recti-muscles; discharge of gonorrhœal pus from both eyes very profuse. Cornea of right eye slightly infiltrated in superficial "laminæ;" chemosis large, phlegmonous and firm; lids much swollen; patient had discharge from the urethra.

RESULTS, &C.

Pressure employed on both eyes. Cornea left eye recovered, opaque from ulceration and perforation; cornea of right eye slightly cloudy, but vision continually improving.

CONDITION OF PATIENT.

No. 15—Epithelium of both corneæ considerably disturbed; chemosis large, firm and phlegmonous, great tumefaction of lids, and abundant gonorrhœal discharge.

RESULTS, &C.

Pressure applied to both eyes, which recovered in good condition.

CONDITION OF PATIENT.

No. 16—Corneal epithelium slightly disturbed; large phlegmonous chemosis; great tumefaction of lids, and abundant gonorrhœal discharge from both eyes.

RESULTS, &C.

No pressure used. Recovered in good condition.

From the preceding table and subsequent remarks, it appears that thirteen patients with purulent ophthalmia were treated. In three cases both eyes with pressure, and both eyes in each case recovered.

In five cases an eye only of each patient was treated with pressure, and the other eye without. All the former were saved, and all the latter lost.

In five cases not treated with pressure, one patient recovered both eyes in good condition; one with synechia anterior of each eye; one losing the right and saving the left eye, and two losing both eyes.

Three patients affected with gonorrhœal ophthalmia were also treated.

In two cases both eyes were treated with pressure. One patient recovered both eyes, and one lost the left and saved the right eye.

In one case in which no pressure was used both eyes were saved.

The above comprises all cases of these types treated in the hospital from August 26th, 1864, to January 15th, 1865, which I have been particular to describe in order to show the nature of these affections as they manifested themselves, and the relative value of the application of pressure in their treatment.

Those of purulent ophthalmia exhibited an unusual degree of malignity; especially in tendency to destruction of the cornea by infiltration or ulceration, and sloughing "couche sur couche."

Some oculists have suggested what occurred to me at the time, that many of them were diphtheritic, but I am not satisfied

such was the case. At all events, the indications of such disease were as well marked in those treated with pressure as in the others. The cases of gonorrhœal ophthalmia presented nothing unusual beyond what has been described above.

I have been careful and explicit in regard to details, on account of the marked difference in the results obtained with and without pressure in the treatment, which, in all other respects, was the same: and the more so, as in five cases circumstances placed it in my power to witness the difference of treatment on the same individuals.

This became possible from the fact of my entire want of knowledge of the use of pressure in such cases, until circumstances forced me to devise some method of staying the ravages of disease over which I could obtain, by all known means, but little control; and it was not until ten eyes out of twenty-four had been lost, that the idea suggested itself to me, which, like many others, was at once carefully and prudently acted upon.

Twelve hours seemed to justify the means adopted, and after twenty-four hours the change in the left eye of case No. 4, the only one at first attempted, was so decisive as to warrant the experiment on a more extended scale.

The results are given in the table.

What I mean by the use of pressure in the treatment of such cases, is not the application of lint wet or dry over the lids with moderate compression, but a *firm, hard, continued pressure upon all parts of the contents of the orbit, especially the anterior*. This I effect in the following manner:

The lids being closed, the orbit is to be packed, as it were, by means of charpie, or picked lint, (scraped lint or cotton wool is not so serviceable,) in such a manner that all parts about the eye, within the orbit, the anterior hemisphere of the globe, and especially the conjunctiva, shall be acted on.

Care must be taken to fill the grand angle, and to have the charpie evenly and regularly disposed *about* as well as over the globe.

Quite a large bunch should be used for each eye, not only to ensure evenness of pressure, but to absorb the purulent discharge. This being done, compression is made by means of a

bandage, or better, a firm elastic band of rubber braid, not less than two inches in width, passing around the head. It should be slowly and regularly increased until the pain, if any there be, in the parts affected, is greatly diminished or controlled, if practicable.

In other words, pressure is to be applied to the eye and surrounding parts within the margin of the orbit to a degree sufficient to so control the circulation as to prevent the destructive tendency of the disease, but not to interfere with proper nutrition. This must, of course, vary with the peculiarities of each case.

But the principle of employing, as constantly as possible, firm, hard, even and continued pressure from the *earliest moment practicable* until the *close of all acute symptoms*, is not to be lost sight of for a moment. The anatomy of the orbit, the mechanism of the lids, and the cushion of adipose tissue posterior to the globe, render this not only possible, but easy.

I have in no instance resorted to it in purulent or gonorrhœal affections of the eye during the acute stages, even after the organ has been irretrievably lost, without greatly diminishing the discharge in a short time, and very materially adding to the patient's comfort in reducing the pain, and modifying subsequent and present staphyloma, as occurred in cases numbered 4, 5, 6, 7, 8 and 12.

While the purulent discharge is abundant, the dressing should be renewed twice during every twenty-four hours. Dry charpie is to be preferred, though moist will answer; yet it is not so elastic.

That pressure will have a potent influence in diminishing the discharge, reducing the tumefaction of the lids and the chemosis, modifying extravasation and exudation, arresting and inducing infiltration of the cornea to become resolved, is now a clinical fact.

The rationale of such action is certainly as simple as the means employed to produce it.

The influence of the virus (be it what it may) induces an extraordinary flow of blood to the affected parts, and often with great rapidity.

Their arterial circulation is taxed to the utmost, and the

venous also; while the capillary connecting them is inadequate to the demand imposed upon it, even when distended to its utmost.

Hence the results which unhappily too frequently follow. Compression of the affected parts diminishes the flow of blood into them, so acts upon the capillaries as to prevent their enlargement, stimulating them to perform their functions, besides producing partial anæsthesia, and controlling or modifying the pain.

Having dwelt sufficiently, I think, upon the uses of pressure in these cases, I now propose to allude to the treatment I have found in other respects most beneficial. Before doing so, a division of cases will be desirable, to illustrate my reasons for adopting certain means.

1st. Those cases in which pain, swelling, heat, redness and phlegmonous or phlegmono-serous chemosis are decided and well marked, and which, usually occurring in patients of full habit, or having that condition favorable to the formation of the so-called "plastic lymph," may be called Sthenic.

2d. Those characterized by "serous puffiness" of the lids, serous or sero-phlegmonous chemosis, little pain, discharge thin, and great tendency to infiltration on the part of the cornea—conditions which usually occur with persons whose systems have been reduced by scurvy, typhoidal disease, chronic diarrhœa, &c.—and which may be termed Asthenic.

Before proceeding to detail the medical, I must allude to certain surgical means, frequently found necessary. It often occurs that the cornea becomes anæsthetized, so much so that the patient feels very imperceptibly the contact of a foreign body —as the point of a small roll of twisted paper, or a small camel's hair brush—and the pupil cannot be influenced by atropia, or only partially so, though *no* adhesions exist between the iris and the capsule.

I have found infiltration of the cornea to follow very closely upon such complications. Deep scarifications, circular or radiated, of the chemosis, or cups to the temple, have, in my hands, been very unsatisfactory in removing or preventing such conditions. No better results seem to follow paracentesis of the anterior chamber, "repeated" or otherwise. Un-

less largely infiltrated, I have frequently succeeded in saving the cornea in such cases by means of Hancock's operation of division of the "ciliary ring." Besides its preventing infiltration and sloughing of that important membrane, the patient will suffer much less pain during the continuance of acute symptoms. Unless the cornea is in an anæsthetized condition, is beginning to be infiltrated, or shows symptoms of sloughing and ulcerating, such an operation should not be resorted to.

I have frequently found the indications for this operation, as mentioned above, to exist with other affections of the eye, and have relieved them in the same manner; but the subject would, of itself, form an extensive article, and I shall therefore not dwell longer upon it here, beyond remarking that Hancock's operation, in relieving such symptoms and conditions, cannot be relied upon to take the place of pressure; neither will the latter, under similar circumstances, relieve the necessity of dividing the "ciliary ring."

The utility of scarifications, deep, circular or radiated, of the chemosis is too well known to be dwelt upon here.

For local application I rely mainly upon bromide of ammonium, atropia, and nitrate of silver. In sthenic cases I prefer the use of bromide of ammonium dissolved in glycerine—forty to sixty grains to an ounce of pure glycerine—which is applied twice daily to the conjunctiva, ocular and palpebral, by means of a camel's hair brush.* It may be employed oftener in some cases, but this will be found, as a general rule, sufficient. Under its influence purulent, and especially gonorrhœal ophthalmia, appears to become rapidly modified, as I have frequently had occasion to demonstrate. The addition of ten grains of tannin to one ounce of the solution adds somewhat to its efficacy, but this is not indispensable.

For asthenic cases the nitrate of silver is most serviceable. I prefer to apply it gently to the mucous membrane of the lids, neutralizing any excess of the salt by proper means. Blood

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* The following will be found serviceable for gonorrhœa:

Bromide of ammonium,	℥ss.—℥j.
Tannin,	℥ij.
Aqua,	ℨij.—Misce.

Sig.—One half ounce to be injected pro re nata.

may or not be taken from the lids, the chemosis or the temple, after the use of bromide of ammonium or nitrate of silver; but this must depend on the size of the chemosis and state of the patient. Atropia will be required to dilate and so maintain the pupils.

For general treatment in sthenic cases I prefer muriate of ammonia in alternate doses, from three to five grains every one or two hours. Asthenic cases are benefited by muriated tincture of iron, five drops every two hours or oftener, if the patient will bear it. Permanganate of potassa is also useful, in $\frac{1}{4}$ grain doses, every two or three hours. But it is evident that all general means must be adapted to the existing condition of the patient. The treatment for purulent and gonorrhœal ophthalmia may, therefore, be summed up as follows:

1st. If anæsthesia of the cornea exists, or it is infiltrating, and especially if the pupil will not yield to the influence of atropia, Hancock's operation of division of the "ciliary ring" is indicated, care being taken to divide all its fibres from the insertion of the iris to its posterior limit.

2d. Application of a solution of bromide of ammonium, (40 to 60 grs. to ℥j. pure glycerine,*) or nitrate of silver to conjunctiva; the former to all parts of the conjunctiva, and the latter to that covering the cartilage of the lids only.

3d. Scarification of the lids and deep incisions into the chemosis, if required, removing the blood with tepid water so long as it continues to flow.

4th. Atropia in solution (iv. grs.–℥j.) sufficient to dilate the pupil.

5th. Application of firm, hard, continued pressure, as soon as practicable, and continued to the close of acute symptoms.

6th. Remove the dressings twice during every twenty-four hours, until the purulent discharge ceases.

7th. Two applications daily of bromide of ammonium or one of nitrate of silver will be found sufficient. Atropia may be used twice daily or oftener, but care should be taken not to continue its employ beyond *producing* and *maintaining moderate* dilatation of the pupil.

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* Glycerine perfectly pure should be used.

8th. A constitutional treatment adapted to the condition of the patient.

It is evident that no single remedy or means should be exclusively relied on in the treatment of purulent or gonorrhœal ophthalmia; but each case, and even each eye, must be managed in accordance with its existing conditions, and the varying symptoms promptly met by appropriate means. In this way we shall be justified in prognosticating favorable results in most cases.

In closing, it is sincerely hoped the special principle of treatment so prominently set forth in this article, as well as all others having any thing unusual of application or otherwise, will be rigidly tested, and the results made known to the profession.

Dr. Williams, (of Cincinnati.)—So far as the author claims priority in the use of the treatment employed, all of us, perhaps, who have read the Ophthalmic journals for some years, know that the treatment has already been suggested and practiced by different persons. Dr. Graefe, in a recent number of the *Archives*, gives a method of treatment of the eye by pressure, and among other diseases to be treated thereby he mentions purulent conjunctivitis. He says, however, there is so much difficulty in keeping the pressure properly applied, and it produces in the patient so much pain and inconvenience, that he has been obliged to give it up. He abandoned the treatment after having tried it in a large number of cases, and being convinced that it was of no particular value. For myself, I have been in the habit of using compression in certain cases where purulent conjunctivitis has reached the point alluded to by Dr. Graefe, and where ulceration of the cornea has absolutely set in. I never depend upon the pressure, however, for arresting the disease. I have repeatedly treated cases of conjunctivitis by application of nitrate of silver, which, in my opinion, is the best remedy for genuine conjunctivitis. Sometimes in treating it with nitrate of silver, ulceration of the cornea has come on, and I have left off the first and resorted to the use of compression, applying the bandage in the manner described by Dr. Graefe. For four or five years I have been in the habit of using those elastic bands which ladies generally use for various purposes, from an inch to an inch and a half in width, and long enough to be moderately stretched in passing round; under this band I place the cotton or whatever else is placed over the eye.

What I wish to state is, I do not believe that compression exercises a beneficial influence over the inflammatory process or the suppuration. As I stated, when I cease making the application of the nitrate of silver, I sometimes make use of compression; and when the symptoms indicate it to be safe to return to the local application of the nitrate of silver, I recommence it, and always witness a rapid diminution of the amount of the purulent secretion, and also a diminution of the amount of redness and inflammatory symptoms that accompanied it. I, therefore, do not believe that the treatment of purulent conjunctivitis by compression can be relied on in every case. In all cases of ulceration of the cornea it is valuable. In cases of purulent conjunctivitis it is impossible to tell what will be the result of your treatment. I have always treated this disease making a reserved prognosis : I cannot tell to-day that the eye will not be lost to-morrow. For some time I have been in the habit of dividing the external commissure of the lids, if there was swelling and tension in the lids, (I think it was first recommended by Dr. Graefe,) to produce at the same time free bleeding, and diminish the pressure on the globe of the eye. But I have not been able to satisfy myself that this treatment had any effect one way or the other except in producing local depletion, which can be just as well produced by the application of leeches to the nose. I have also resorted to paracentesis where implication of the cornea was threatened. If the chemosis be great, I make it a point to practice paracentesis of the cornea; and if any one method of treatment be better than another for this, it is paracentesis. I make it a point never to wait, as I said before, for ulceration, but puncture the cornea, frequently twice a day during severe symptoms. It, of course, produces a little pain, but may be done under the influence of chloroform. I have sometimes resorted to arteriotomy, and have occasionally saved eyes in that way, which, I am confident, would have been lost by any other treatment. After several years' experience in this class of cases, I have reduced my treatment to a very simple one, using nitrate of silver. As soon as I see what the difficulty is, I evert the upper and the lower lid, and wash them with a twenty-grain solution of nitrate of silver. Formerly I used the lapis mitigatus, as advised by Dr. Graefe, but I now prefer the solution. I wash the everted eyelids as extensively as possible with a solution of nitrate of silver, sometimes carrying it as high as forty grains to the ounce; infants bear it much better than adults. I have seen in some cases the secretion reduced one-half in twenty-four hours, and the greatest possible diminution in the swelling. For infants, I think nitrate of silver, to which I wish especially to call

ERRATA.

Page 22, line 29 } for "arteriotomy" read "iridectomy."
" 23, " 13 }

your attention, will, in most cases, effect a cure. Adults cannot be so successfully treated. I use ice water or cold water compresses to the eyelids, keeping them up day and night as long as the acute symptoms continue; and if the lids are not very stiff and the soreness too great, and especially if the purulent discharge is thick and abundant, I resort to an application once or twice a day of the solution of nitrate of silver in the way I have mentioned; and when the cornea is threatened or the symptoms are severe, I resort to a division of the external commissure. By means of this treatment I have obtained better success than by the use of any other remedy. The division of the ciliary muscle, as recommended by Dr. Hildreth, is, in my judgment, a dangerous remedy. I do not think it likely to prove as beneficial as arteriotomy. I do not think anybody was ever much benefited by that operation practiced for purulent conjunctivitis; nor do I think I could be now induced to practice it.

Dr. Noyes.—In this communication made by Dr. Hildreth, I do not remember that he states whether compression, as recommended by him, excites pain, and, if so, how far he allows this fact to modify his treatment. Dr. Hildreth has stated to me personally that the pressure when first employed is painful, but that he continues it and increases it till the pain is absolutely annulled.

Dr. Jeffries.—There is one thing mentioned in the report of Dr. Hildreth to which I will refer. He says: "Carry the knife back so as to divide the fibres of the ciliary muscle from the iris to the choroid." I wish to refer to the anatomy of the muscle, and in the course of the discussion opportunity may be given me to do so. I will say nothing further now than to call attention to the erroneous idea of the anatomy of the eye which he seems to give.

Dr. Agnew.—Mr. Chairman, I am very much interested in the remarks which the gentlemen have made on the general subject of purulent and gonorrhœal ophthalmia, in connection with this paper by Dr. Hildreth; and I was very forcibly struck, during the reading of the paper, with the apparently unguarded manner in which the doctor has yielded himself to, I fear, some preconceived view, as to the value of compression as a remedy. We are led in the earlier portion of the paper to believe that the doctor has found some real curative value in pressure as a treatment for gonorrhœal ophthalmia; and yet, unless I am very much mistaken, he in all those cases subjected the eyes not only to treatment by pressure, but to two solutions daily of bromide of ammonium or one of nitrate of silver; so that, so far as this paper is concerned, we really have no evidence sufficient to furnish the basis

for a conclusion as to the value of pressure as recommended. If we could have had one or two cases cited in which pressure without the intervention of any local remedy had been used, then we should be better prepared to appreciate the treatment proposed. I am very glad to hear the frank criticisms that have been made upon the paper presented by Dr. Hildreth, and the spirit of scientific fairness that has characterized the remarks of the gentlemen who have preceded me. I only wish the doctor were here to listen to them, and regret that he has not the opportunity that he certainly is entitled to, of replying to the criticisms evoked by his paper. But as he has sent the paper here without his personal presence, I do not think we are guilty of any discourtesy in giving it this discussion. I have listened to Dr. Williams' statements of his experience in the treatment of purulent and gonorrhœal ophthalmia with great interest, and am ready to go with him step by step in the experience by which he has been led to his conclusions as to what is the more valuable form of treatment for this disease. I agree with him entirely in believing that in purulent ophthalmia the treatment should be exceedingly simple; and I have had gratifying results in watching the progress of natural processes in curing *ophthalmia neonatorum*, in using a much weaker solution of nitrate of silver than the doctor has employed. I very seldom exceed a half-grain solution in the treatment of ophthalmia in infants, and consider cleanliness a very great and ruling remedy. As to the treatment of adults, I think Dr. Williams' experience exceedingly valuable, and it lies very nearly parallel with my own.

Dr. Derby, of Boston, read an account of a case of "Ophthalmia Intermittens," as follows:

The term "intermittent ophthalmia" savors, indeed, of the ophthalmology of a past generation, but is the only one I could find at all applicable to the present case. This case is believed to be unique of its kind, and is presented to the Society more on account of its curious nature than of its practical bearings.

Mrs. S. H., aged 59, a lady of full habit and in the enjoyment of perfect health, came to consult me, March 17, 1864, complaining of some smarting and a sensation as of a foreign body in right eye. An examination revealed the following state of things. Extending from the inner edge of the cornea —where it occupied a space about 2‴ in breadth—back to and

below the caruncle, widening all the way, was a belt or band of raised vascular tissue, evidently involving the conjunctiva and subconjunctival tissue. It stopped short at the cornea, the substance of which could not be discovered to be in the slightest degree affected, and resembled an exceedingly pronounced pterygium, the corneal portion of which had been dissected away.

On investigating the history of the case, it was found that this difficulty first made its appearance seven years ago, being two years after the cessation of the catamenia. Attention was at first attracted to it by a pricking and smarting of the eye, and a sensation as of a foreign body between the lids. This would be observed the first thing in the morning, the patient having gone to bed well the night before. On inspection, the same reddish band would be visible—faint at first, rapidly increasing in prominence and deepening in color, and passing off in three or four days. At this time the attacks occurred every four or five days, so that one would barely be recovered from before another would have to be undergone. Six weeks later they began to diminish in frequency, occurring every eighth day, now and then waiting till the ninth. During the first year the interval never exceeded ten days, and during the second, eleven. For a year and a half of this time patient was under treatment, and used dry cupping, as well as some constitutional remedies, without effect.

As time went on the interval between the attacks gradually increased, averaging finally from thirty to thirty-three days, and on one occasion reaching thirty-eight. The duration of the attack came to average about three days, and it was observed that the color of the band was less red, and the uncomfortable sensation in the eye less marked.

I give the following dates of recurrence since the patient has been under my observation: In 1864—March 17th, April 19th, May 19th, June 26th, July 29th, August 29th, September 24th, October 31st. The dates of the November and December attacks were lost. In 1865—January 17th, February 12th, March 22d, April 19th, May 10th, and June 10th.

As before stated, the patient goes to bed perfectly well, having had no premonitory symptoms, and either notices a sensation

of fullness in the eye if she wakes up in the night, or observes the red patch on going to her mirror in the morning. No treatment appears either to affect its duration or recurrence, insufflation of calomel, atropine, &c , having been tried in vain.

It should be stated that the eyes are used without restriction or fatigue, and in the interval are throughout perfectly normal, presenting no trace whatever of the affection.

I have consulted a number of authors, in order to ascertain if any similar case was on record. *Chelius** speaks of intermittent inflammations of the eye, "ophthalmiæ intermittentes"—regularly occurring periodic attacks, with as regular intervals. His account is, however, very vague, and the longest interval observed by him was eight days: of this a single instance. *Himly*† adverts also, in general terms, to similar cases, and seems to refer particularly to attacks of iritis, simple and serous. He has observed an interval of fourteen days. *Edmonstone*‡ refers to the disease as often lasting years, and ending in what he calls "amaurosis." The two most frequently cited cases of intermittent ophthalmia are those reported as occurring in their own persons, by *Dr. Curry*,§ in 1812, and *Dr. Bostock*,‖ in 1819. The first gentleman labored—as nearly as can be judged from his own account—under repeated attacks of keratitis, in some of which there was a marked exacerbation on the second, in others on the seventh day. Dr. Curry's case seems to have been simply one of hay-asthma—coming on every summer, and exhibiting a particular tendency to attack the conjunctiva prior to the other mucous membranes. Finally, *Mackenzie*¶ has a short chapter on this affection.

The literature of the subject is thus seen to be very limited; in fact, all the recorded cases differ very materially from the present.

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* Handbuch der Augenheilkunde. Bd. 1, s. 271.

† Die Krankheiten und Missbiddungen des menschlichen Anges. S. 498.

‡ Treatise on the Varieties and Consequences of Ophthalmia, &c. London, 1816. P. 133.

§ Med. Chir. Transactions. Vol. iii., p. 148.

‖ Med. Chir. Transactions. Vol. x., p. 161.

¶ Traité Pratique des Maladies de l'Oeil traduite de l'Anglaise. Paris, 1857, p. 130.

Dr. Jeffries.—I am inclined to think that a solution of this case will be found in the connection between the uterine system and the innervation of the eye. It has occurred to me that the experience of Brown-Séquard, in reference to the effect of excitation or nervous stimulation upon tissues in which vascularity is visible as in the eye, would be valuable. I wish that Dr. Derby would, if this case is printed in our proceedings, communicate with Dr. Séquard in reference to it. It seems to me that his suggestions would be valuable.

Dr. Derby.—The disease did not make its appearance for several years after the cessation of the menses. It has greatly diminished from year to year.

Dr. Williams, (of Cincinnati.)—One word in connection with this paper. I have an imperfect recollection of a case, which was very obscure to me at the time, and which I have never yet been able to comprehend. It cannot depend upon the suppression of the menses, because this was in a young man. He came to me with a very marked congestion of the sub-conjunctival tissue in one eye, commencing on the inner side, but not confining itself to that portion of the sclerotica, extending itself in the course of twenty-four hours over the whole surface of the globe. It never led to any opacities of the cornea, and almost disappeared sometimes in the course of thirty-six to forty-eight hours. The use of various astringents seemed to have no effect upon it. It was not a case of sclerotitis; it was evidently a case of congestion of the sub-conjunctival tissue, recurring periodically. I treated the young man during four or five different attacks, (I forget how many,) and they lasted, as I said, from thirty-six to forty-eight hours, and the disease usually traveled round the whole cornea, involving the whole sclerotica, accompanied by a great deal of pain during the first few hours. The intervals between the attacks were from eight to ten days. I think the attacks occurred regularly once a week soon after that. I gave him different kinds of treatment internally and topically, and was not satisfied that any thing had any effect upon the disease. The man has been perfectly well since.

Dr. Bumstead offered the following resolution:

"This Society shall have the prior right to publish papers read before it, and the authors of such papers shall not publish them elsewhere until after their publication in the Society's proceedings, without the consent of the Publishing Committee, or unless the Publishing Committee fail to insert them in the issue of the proceedings next following their reading; nor in

any case shall papers be published as having been read before this Society without the consent of the Publishing Committee."

Adopted.

Dr. H. W. Williams gave notice of amendment to the By-Laws, viz., to substitute in place of "annually," in By-Law No. 3, the word "biennially."

On motion, adjourned.

SECOND DAY—MORNING SESSION.

Dr. DELAFIELD, President, took the Chair. Minutes of preceding day read and approved.

The business in order was the topic of discussion selected last year, viz.: "The morbid conditions, functional and organic, included under the name of Asthenopia; their pathology and treatment."

Dr. DYER, of Philadelphia, opened the discussion by reading the following paper:

Asthenopia not connected with Hypermetropia.

There are certain cases of asthenopia which have interested me much, and I beg to call the attention of the Society to them for a few moments. In these cases there is no hypermetropia, latent or apparent. The accommodation is good. There is in a majority of cases myopia more or less marked, sometimes even as high as $\frac{1}{3}$ or $\frac{1}{2}$. The symptoms vary in some important particulars from asthenopia dependent on hypermetropia. The patient never complains of being obliged to suspend the use of the eyes while reading, from the letters becoming indistinct or the words running together, but it is either absolute pain in the eyes themselves, or a sensation so disagreeable that he at once ceases to use them. He always says that if he chose to continue he could do so, as his vision is as clear as when he commenced to read. Rest for an hour does not relieve him, and he can not recommence his work as the hypermetrope can. The pain or sensation lasts generally for several hours, often over night, and sometimes for several

days. The pain is generally confined to the eyeballs, and does not affect the forehead and temples. The mind has a great influence on the length of time the eyes can be used without feeling the pain. I have known ladies who could read a long letter from an absent husband or others in whom they were particularly interested, when they could not read half a page from a book or an indifferent correspondent. The amount of use that these patients can bear is very inconstant. Sometimes they can read for half an hour, and the next day or week they can not bear the sight of a book, and dread any attempt to use the eyes. They generally let the affection run on for some months before they seek medical advice.

General fatigue of the whole body does not often affect the eyes as it does in hypermetropes, and they can use them as well after prolonged exertion as when they are not tired. Sometimes there are uterine or heart complications, but not generally. Masturbation is often acknowledged by these patients, but whether oftener than in other diseases I can not say. There is generally some intolerance of light, especially of gas light, which is not dependent on the use of the eyes. They can bear the light if excited, and can often go to the opera or a party without feeling discomfort at the time, but the next day or two they suffer the penalty. At home, when there is no excitement, they avoid the light. The pain produced by indiscretions of the above kind is almost exactly like that brought on by using the eyes. It is mostly found in persons under thirty years of age; when occurring after that age it is generally a consequent of using the eyes too soon after confinement. It is restricted almost entirely to persons of the better class of society. I have never seen it connected with strabismus convergens, but sometimes with strabismus divergens. I have seen only one case complicated with astigmatism.

The ophthalmoscopic appearances are not well marked or constant. Generally there is nothing abnormal. Occasionally it is observed, when the myopia is excessive, that the size of the staphyloma posticum does not correspond with the degree of myopia, but this is often the case when no asthenopia exists. Frequently the optic nerve is "dirty," *i. e.* not clear, and also the choroid, which is striated. These striæ run towards the

posterior pole of the globe, but this appearance is so common that it can not be mentioned as characteristic of this kind of asthenopia.

From the observation of a number of these cases I was led to the conclusion that some trouble with the accommodation was generally the cause of the pain or disagreeable sensations. An emmetropic person, with an accommodation of one-fifth, ought to be able to read without fatigue at ten inches, as he would only use half his accommodation. On the other hand, a person with myopia one-tenth should read at that distance without using his accommodation at all. Still, both complain of asthenopia. It occurred to me, although the most careful examination failed to detect any insufficiency of the internal recti, that still there might, in both cases, be a discrepancy between the power of the ciliary muscle and the angle of convergence. In other words, I concluded that there was—

1st. Some disturbance of the relative accommodation.

2d. There seemed to be a want of tone or power of the ciliary muscle for continued action.

3d. Want of mental energy, the patient having lost confidence in his power to use his eyes.

My object is to offer to your notice a course of treatment which I have used during the past two years, which I have called gymnastic exercise of the eyes. It seems to answer the three indications mentioned above. Of course, the general health of the patient must be cared for, and this treatment is only added to the general course of tonics, air, exercise, stimulants, counter-irritants, attention to the uterine functions, &c.

1st. I change the relation of the accommodation to the angle of convergence of the axes of the eyes, by glasses. To the emmetrope I give convex, No. 30 or 36. With a myope of one-tenth or less, I simply correct the myopia. In the higher grades of myopia it suffices to carry the far point out to 10 or 15 inches.*

I will, for example, suppose cases of these three classes,

* I have treated several cases of asthenopia which, from the general symptoms, seemed to belong properly to this class, but in which a slight amount of hypermetropia existed. I gave them convex, No. 36, plus the degree of hypermetropia. They all recovered rapidly.

using the same fractions in each case, for the sake of simplicity.

An emmetrope, with an accommodation of $\frac{1}{6}$, holds his book naturally at 12 inches, at which distance he uses one-half of his accommodation. The angle of convergence of the axes of vision to 12 inches is not sufficient for him to use one-half of his accommodation, and he is furnished with convex, No. 36. If he still holds his book at 12 inches, he uses only one-third of his accommodation, and the relation of the convergence of the axes of vision to the accommodation is altered, and he finds great relief. He will probably not do this, *i. e.* hold his book at 12 inches, but bring it to 9 inches, when he will, with this convergence, be able to use one-half of his accommodation, which is exactly the amount used when supplied with + 36.

A myope of one-twelfth (accommodation as in the previous case, one-sixth), can not converge to twelve inches without using some of his accommodation. He is furnished with $-\frac{1}{12}$, carrying his far point to $\frac{1}{\infty}$ (infinity). If he then holds his book at twelve inches, he uses one-half of his accommodation, which, at once, changes the habitual relation of it to the convergence of the axes of vision.

In a myope of one-sixth (Ac. = one-sixth), the condition is similar. Furnished with $-\frac{1}{12}$, the myopia is partially relieved, and if he hold his book at 12 inches he would use no accommodation at all. But he will not do this, but from habit will hold his book nearer, say at 8 inches, where he will use one-half of his accommodation, and do it with ease. Cases of this third class are not as common as those of the first and second.

Having thus altered the relative accommodation we come to the practical use of it in fulfilling the second indication, viz.: want of tone or power of the ciliary muscle for continued action.

As before remarked, these patients rarely seek professional advice till they have suffered for several months, sometimes years, and the ciliary muscle has lost its tone. The act of accommodation is purely muscular. Why should not the ciliary muscle be strengthened by regular exercise as well as any other muscle? My course of treatment has been as follows: I order the patient never to use his eyes without the glasses prescribed,

and never to use them except as I direct. Sewing, writing, music or painting, must not be attempted during the first part of the treatment. The patient must be warned that at first some inconvenience will be found, till he becomes accustomed to the glasses. He must select a book with good, clear type of medium size, and read, according to the case, 3 to 15 minutes in the morning. If no pain follows, read a minute longer at noon, and increase a minute at evening (not after half an hour before sunset). If the pain following the first reading lasts until the time of the second, the patient must not mind it, but read a minute less than he did in the morning, and a minute less at night, if it still continues. In this way a point must be found when he can read a certain number of minutes without pain. Then let him progress a minute each day, or faster, if prudent, though it is better to go too slowly than too fast. When the patient gets up to 30 to 40 minutes three times a day, other use of the eyes than reading may be carefully substituted. When 60 to 70 minutes are reached, the glasses (except in the third class) may be gradually dispensed with. The patient may read at noon one-quarter of the time without them, then one-half, and so on, leaving them off gradually. The surgeon must be guided by the nature and course of the case. One minute a day seems a small matter, but if a person begins with reading one minute three times a day and increases a minute each day, at the end of a month he will be reading an hour and a half a day.

I have found it of great assistance to explain the rationale of the treatment to the patient, and, as I have before remarked, these cases rarely occurring except in the educated classes, they readily understand it, and are anxious to assist the surgeon in the treatment. For this purpose, the term gymnastic exercise of the eyes is useful. I tell them that in reading, pure muscular action is required as much as in lifting a weight; that through want of use, general debility, or some derangement of the general system, they have lost the power to exert the muscle brought into action in reading without fatigue; that they can strengthen this muscle and increase its power of endurance by regular, constant and systematic exercise, as well as any other muscles in the body.

I come now to the third indication—want of mental energy;

the patient having lost confidence in this power to use his eyes. This course of treatment serves to distract the mind of the patient and restores his confidence in his ability to use his eyes. He has become discouraged; he has had the horror of blindness carefully instilled by friends and sometimes by well meaning physicians, who, not feeling quite sure of their ground, err on the safe side, and prescribe entire rest. In these cases "the safe side" is the wrong side. When the glasses are procured and the patient is assured that there is no absolute disease of the eye as revealed by the ophthalmoscope, he commences his course of treatment with hope and zeal. The mere fact that he is told that he *must* use his eyes gives him, to a certain extent, the power to do so.

I have notes of forty cases of this peculiar kind of asthenopia treated in this manner, and in thirty-eight the results were highly satisfactory. In one of the two failures there was serious uterine disease; and in the other, the patient was obliged to leave the city before the treatment had had a fair trial.

The necessity of persevering and following directions to the letter can not be too carefully impressed upon the mind of the patient. If they are careless and do not read regularly or read too much, they will be sure to be thrown back, and have the whole ground to go over again. As these cases are always long, extending over months, it rarely happens that, from necessity or carelessness, some indiscretion is not indulged in which entirely throws them back, and they can not use the eyes more than they could when they commenced treatment. However the improvement, when this has happened, is much more rapid than at first. I will give you one or two cases showing how this may occur, and how careful both surgeon and patient must be.

Dec. 9, 1863, Miss ——, æt. 27, has been in the habit of sewing almost all day for nine years. A year ago she had "some trouble" in her eyes; since then she has not been able to use them at all.

She now complains of pain in the eyes and forehead and moderate intolerance of light. Can not read ten minutes without bringing on severe pain. Has slight leucorrhœa and pain in the back. No amblyopia; no hypermetropia; no insufficiency

of internal recti. Ophthalmoscopic appearances normal, except slight congestion of the optic nerve of the right side.

I ordered convex, No. 36; Syr. ferri pyrophas., veratrine (grs. x–℥i.) ointment for the forehead, warm clothing, exercise in the open air, a tablespoonful of whisky before meals, and the gymnastic exercise, commencing with five minutes three times a day.

Feb. 21st, 1864.—Patient read seventy minutes twice yesterday, and her eyes felt so well that at the third reading she thought she would see if she could not read eighty minutes. She did so, without pain or trouble of any kind, but this morning the same old sensations came on, and she was only able to read three minutes. All the previous symptoms had returned. It was not at her menstrual period. She was ordered to begin again and read only three minutes at a time, and increase.

March 30, 1864.—Up to thirty-five minutes. Continue.

April 20, 1864.—Reads an hour three times daily without trouble. Continue. To see me again if there was any more trouble.

May, 1865.—Patient has not returned, but I have heard indirectly, from a friend of her's, that she has not had any trouble from her eyes for a long time.

In this case the indiscretion was very slight, only increasing ten minutes at a single reading when she was reading seventy minutes three times daily.

In another case a patient, with general derangement of the nervous system, myopia one-eighth, (had not used her eyes for a year,) was improving rapidly, and was reading thirty minutes at a time. She undertook some sewing and worked all day. She was confined to the bed for several days, and had intense neuralgic pain in consequence, which was relieved by subcutaneous injections of morphia.

In another case, Miss B., æt. 20, consulted me Feb. 16, 1863; had not been able to read for two years. Myopia one-eighteenth. Subjective symptoms as before described. Prescribed concave $-\frac{1}{18}$, and general treatment of iron, exercise, &c. It was not until October 22 that she could read ten minutes with ease. During this time she had been obliged three times to go back to two minutes at each reading, and increase gradually.

Dec. 19, 1864.—Can use the eyes without pain. Since then have not seen the patient, but have heard from her relations that she has no more trouble.

I will mention a case whose cure I consider entirely dependent on the regular use of the eyes. Mrs. ——, æt. 41, consulted me, and gave the following history: Since she was married, nineteen years ago, she has never been able to use her eyes at all. Her husband has been in the navy, and of course absent nearly all the time. Whenever she received his letters she read them, but was sometimes confined to her bed for two days in consequence, and always suffered intense pain in the eyes and head. She has been under treatment many times without benefit. She can not read two lines without pain, which often lasts over night. She has myopia $\frac{1}{4}$ to $\frac{1}{2}$. Health rather below the standard. Has taken tonics and iron for the last ten years. Slight maceration of the pigment of the choroid. Posterior staphyloma smaller than would be expected from the amount of the myopia. I gave her Blancard's pills, a stimulating wash for the forehead, and concave one-twelfth for reading. I told her to begin with five minutes and follow the plan explained before. In eighteen days she read nineteen minutes without a particle of pain, and came to me with enthusiasm and said: "Doctor, I have read a book through; I have not read one for nineteen years." Ten days after she reported that she had on one occasion read three minutes too long, and was put back to ten minutes. Two months afterwards she was only up to fifteen minutes, having in the meantime been twice up to thirty minutes, but having fallen back through indiscretions. Since then she got up to ninety minutes, and kept there without trouble. During the treatment I changed the preparation of iron, and also gave her veratrine ointment.

In this case, I do not think the favorable result was owing to the iron, for she had been taking it for ten years, more or less, and had been taking and was taking the ferrated elix. cinch. when I first saw her.

Dr. Noyes.—I should like to make the inquiry of Dr. Dyer, if, when he has brought these patients up to what he considers a fair amount

of reading power—that is, for example, half an hour at a time—he permits them to dispense with their glasses?

Dr. Dyer.—I do not permit them to dispense with the use of the glasses until I have got them up to an hour and half three times a day, which is fair use of the eyes; then I allow them to drop them gradually: for example, one session during the day, generally at mid-day, to leave off their glasses and read a quarter of the time, and see if they can do it; and then, if they can, a little longer next time, till they can entirely dispense with them.

The President (Dr. Delafield).—If the Society will indulge me, this is a subject of which, for forty years, I have seen so much that I feel as if I must say something upon it. There is now living a lady, married in 1812, wife of a classmate of mine, at Yale College, who, in consequence of this disease, has never read or written during all this time. Within three months I have had as patient a lady, eighty years of age, with this same effect. The common case, as you all know, is with young people, though no age is exempt from it; no period of time will allow a case to get well spontaneously. I believe I can say I have hardly known a case to get well without medical treatment. Every case that has come to me has been told, sometimes by medical friends, sometimes by others, "rest your eyes and you will get well." I never saw a case get well by resting the eyes. This difficulty occurs very largely, as you all know, in girls educated at boarding schools; very largely in girls more or less hysterical, at all events more or less delicate, from imperfect and improper physical management, improper diet, want of exercise, want of fresh air. The symptoms are very like: it is true there is a variety, but I do not think the variety is material; I find very much the same treatment adapted to all. For instance, as a general rule, the sight, so to speak, is perfect; the patient looks at an object perfectly well. I have not found that a large proportion of them were myopic—a small proportion in my practice; and I see very much of this particular disease. I have seen and treated many hundreds of them within the last forty years. In a moderate proportion of cases, after the patient uses the eyes a certain length of time "the eyesight blurs," as they use the phrase; they do not see as well. This is an exception to the general rule. I do not find it necessary in treating the case to remark the difference. I did not intend to have said any thing on this subject, and therefore have not arranged my thoughts—so my remarks will be somewhat desultory.

The principle stated by Dr. Dyer is mainly the correct one; I have been in the habit of applying it for many years. Some of you who

know what kind of practice I have had in the city are aware that I see a great many women with diseases peculiar to their sex. My attention was first brought to this particular mode of treatment by the fact that so large a portion of the women coming to me with uterine diseases had been told, "you must keep still." They have kept still for months, some of them for years, and have got no better. They come to consider quietude their only safety. I saw, this morning, a patient with moderate hemorrhoids; I can not get her to get off her sofa; the consequence is, she suffers all the time. Well, there is a whole class of diseases of the female constitution aggravated by indulgence; that is, they make an attempt to do a particular thing which causes pain, and finding that the pain occurs, they feel it will be wrong to pursue it. Now, in cases, for instance, of ordinary ulceration of the *os uteri*, the practice general in our profession is, to keep these patients quiet; and they will hardly ever get well if they are kept so. I say to these patients, "you ought to walk about," or "you *must* walk about; go on from day to day, and by and by you will acquire the power;" and after a short time such patients go on horseback, and take any amount of active exercise, notwithstanding the ulceration of the *os uteri*. They get well. Such cases I am in the habit of seeing from necessity, and I treat them in this way as a general rule. I remember at this moment a lady brought to me from Milwaukee, who had been four years on her couch with one of these affections, thinking she could not walk. In two months she rode on horseback, and in three months went to Europe, by adopting this principle and attending to her general health. Of course, this principle alone was not sufficient. Many years ago, in the Dublin Hospital Reports, the application of alkaloids, those which have an irritating effect on the skin, was recommended, and it was taken up, not by the profession, but by an empiric of this city, and his success in the treatment of this disease by these alkaloids was very remarkable; but the profession did not take up this particular class of remedies. That class of remedies, conjoined with the principle that Dr. Dyer has been elucidating, and attention to the patient's general health, I think I may say, will cure forty-nine cases out of fifty of this troublesome disease. I hardly hesitate in saying to a patient coming to me, "I think you will get well in the course of a few weeks." The care of the patient's general health, however, is the foundation of every thing. All these patients are nervous, sensitive; as a general thing all of them have been in the habit of reading and writing. Few of them have been in the habit of taking the amount of fresh air and exercise necessary. This want of exercise and

management of the general health very much originates, it appears to me, from the fact that our profession do not go sufficiently into detail, in telling patients, for instance, every thing they may eat, and every thing they must avoid; every thing that goes into their mouths must be regulated; also the precise amount of exercise, exposure, and fresh air. We are so much in the habit of saying, "you must carefully avoid indigestible food"—that amounts to just nothing. If we go accurately and carefully into detail in giving our patients directions on this subject they will get the benefit of them and derive advantage; and so in regard to the hygienic directions generally. All this I consider very essential to the foundation of the treatment; but the application of the alkaloids is the remedy. In the first place, I give the patient a lecture as to the management of her general health, after catechising her very carefully as to all her different habits. Then I at once rub upon her temples and forehead, and perhaps behind her ears or the nape of the neck, say, the saturated tincture of aconite, *or a solution of veratria*, gr. iv., *ad aquam*, ʒi.; and I say to the patient, "Now, when you go home see how much you can read. You certainly can read fifteen minutes the first time." And, under the influence of this article, (where it is producing a powerful influence,) she can. As a general rule it is so after the application of one of these powerful stimulants. Then the practice is to make, every day, one of these efforts. Saturated tincture of aconite is one stimulant. The next day I would apply a moderately strong solution of two grains of *veratria* to the drachm, applied in the same manner, the same way. Then I apply something like Granville's Lotion. I use equal parts of aqua ammoniæ and alcohol—say two ounces of such a mixture. That is applied for thirty seconds to the forehead, temples, back of the neck, behind the ears, always stopping short of vesication. Every other day some one of these things is done. I find, as a general rule, if the patient in the mean time will have followed my directions as to general health, she can, in the course of a fortnight perhaps read half an hour. Poor patients—infirmary patients—can not be gotten well in this way. I do not find that prescribing these things—telling patients about these things—answers any purpose. I have often received letters and answered them, prescribing what should be done, but relief has not been afforded. The surgeon himself must see to it. It is troublesome to the patient; she neglects the applications and fails to observe all the directions; and I know of no other way of producing the desired effect than for the physician to attend to it himself. The only other mode in which these applications in very obstinate cases are employed, is

by a solution of veratria applied to the eye itself. It is very painful. To a grain of veratria put an ounce of water. I never went beyond a grain. I used to employ it for obstinate cases of *asthenopia*, but lately I have not found it necessary; I can get along without it. I know my friends in this city—and I have often talked with them on the subject—have not seemed to attach as much importance to this class of remedies as I do. I no longer feel any doubt about the cure of these cases; and, although these remedies may not be infallible, their effect is so good that in using them I have never failed.

I suppose I might talk all day, gentlemen, upon this subject, but I wont tire you. These are the main ideas which I wish to throw out upon the subject. The exercise of the eyes, as insisted on by Dr. Dyer, I look upon as called for in these cases—the forced use of the eyes, not stopping simply because there is pain. By the way, I remember a curious fact which occurred a good many years ago. A gentleman who had this disease told me he determined not to be conquered by it, and he went out into the bright sun, and let the sunlight fall upon the book, and then read in spite of the distress it gave him; he said it did him good, and he got better. This very thoroughly illustrates the principle Dr. Dyer insists upon.

Dr. Derby (of Boston).—I have but a few hastily prepared remarks to offer on the classification of asthenopic affections, and the relief of one of the more important.

Understanding by asthenopia the inability to sustain the consecutive use of the eyes on near objects, the vastness of the field opened for discussion becomes at once apparent. And, owing to the variety of structural anomalies, as well as of local or general morbid processes that may bring about a state of things coming, to some extent, under the above definition, the necessity of classification makes itself at once felt.

It was originally proposed to divide asthenopia into two great classes :

1st. Where the continued use of the eyes on near objects is physically—

2d. Where the same is optically, impossible.

The classical description of the *first* by Donders* is familiar to all. I give it in his own words : " All work on near objects causes either pain or an extremely disagreeable sensation in the eyes, sometimes, too, redness, blinking with the eye-lids, a disposition to close the eyes,

* Archiv für Ophthalmologie, Bd 4, Abth 1, S 330.

etc., so that it becomes necessary to cease from work. The symptoms then generally diminish. Sometimes they gradually assume a more permanent character and then become very obstinate. Vision is of natural acuteness. The range of accommodation remains normal, even though the eyes be wearied and painful. Not infrequently a small amount of myopia is present. Convex glasses are of no use. I can give but unsatisfactory hypotheses as to the nature of this affection. Nor am I inclined to believe that hyperæsthesia of the retina lies at the bottom of it."

In this class of cases, then, the eyes can not be used on near objects on account of the pain and inconvenience resulting. It will be observed, however, that the vision, up to the last moment of the act, remains as distinct as at first. In the *second* class the symptoms are so familiar that it seems superfluous to recall them. Indistinctness of vision arising after a more or less continued effort, accompanied by pains in the forehead, a flow of tears and a disposition to close the eyes, all of which phenomena are relieved by rest.

Into one or the other of these classes every case of asthenopia may be brought; the *first* as little understood in our day as when Donders first wrote in 1858, and when firmly fixed as little amenable to treatment, an *ignis fatuus* among ophthalmic affections, in one case inherited, in another the result of imprudence, often absent in the invalid and present along with the most vigorous health—a complete enigma as to its seat, its cause, or its cure—more common, I think, in this country than in Europe, and, as far as my observation reaches, more commonly met with in the East than in the West, decreasing in frequency of occurrence as we withdraw from the Atlantic seaboard. The *second*, generally congenital, and reducible to one or two causes —removal of the boundaries of the field of accommodation from the eye, or insufficient muscular action; in other words, hypermetropia or insufficiency of the internal recti.

I have carefully collated the cases of asthenopia occurring in my own private practice, excluding infirmary patients as offering relatively fewer cases of the affection, and less opportunity for subsequent study. Out of 1,800 recorded cases in general ophthalmic practice I find 369 cases of asthenopia in general. Of these 241 belonged to the first class and 125 to the second, or asthenopia simplex. Nearly all of these latter were dependent on hypermetropia.

I am aware that two years after his views on the subject of asthenopia were broached, the system of classification above mentioned was given up by Donders, who adopted the second division as

the type of the affection and insisted on hypermetropia as almost invariably the cause. He says,* "I readily admit that many different conditions were included under the name of hebetudo or asthenopia. When inconvenience was felt on continued exertion, this appeared to some sufficient to justify the inference that asthenopia existed. On this account different forms of irritation, congestion in myopic eyes, hyperæsthesia of the eye, with increasing pain on exertion, different affections of the retina and of the choroid, nay, even the beginning of trachoma, and foreign bodies in the sac of the conjunctiva, might all be united under one denomination. But I can not concur in the adoption of such a primitive semeiotic method. It leads inevitably to confusion of ideas and of conditions."

Undoubtedly the causes here cited give rise to symptoms more or less resembling those of true asthenopia. But, abstracting entirely from such and all of them, it must, I think, be admitted that in our country and climate there exists a widely diffused and exceedingly prevalent affection—generally to be traced either to excessive use of the eye in health, or to the premature use of it during the convalescence from some debilitating disease of the general system, where continued use of the eyes on near objects is impossible without present pain and subsequent discomfort. The eye is, to all appearance, both externally and ophthalmoscopically, absolutely normal. Paralysis of the accommodation fails to discover a vestige of hypermetropia. The interni are of normal strength. The general health may be satisfactory —often indeed, I admit, is not. Sometimes, under the influence of an alcoholic stimulus, the symptoms temporarily disappear, or under the excitement of important business the eyes are used with apparent ease, and, when the excitement ceases completely relapse into their old condition. This affection may last weeks, months, or a lifetime, and in the majority of cases resists any and every therapeutic agent. That it is excessively prevalent among us I think none will deny, and what to call it except asthenopia, or its synonym hebetudo, I am at a loss to conceive. The term "morbid sensibility of the retina" has justly been relinquished—an inconvenient name, which in itself begged a controverted question.

A single word, in conclusion, on the subject of hypermetropia. This great cause of a leading form of asthenopia of course occurs as such in every conceivable degree. I do not remember to have found trouble arising from a less degree than $\frac{1}{70}$, while out of more than 120 cases,

* On the Anomalies of Accommodation and Refraction of the Eye. London, 1864.

six were found where $H=\frac{1}{7}$, and three where $H=\frac{1}{6}$. Of course acquired hypermetropia is here excluded. Some curious instances of inherited hypermetropia came under my observation. The two Messrs. R., one possessing $H=\frac{1}{12}$, the other also hypermetropic in a high degree, married wives each of whom had $H=\frac{1}{10}$. Of the issue of the first couple, three daughters consulted me on account of asthenopia, and were found to have Hm $\frac{1}{30}$ to Hm $\frac{1}{36}$. Two children of the second couple have respectively $\frac{1}{1}$ and $\frac{1}{6}$.

As is well known, the original method of treating asthenopia arising from this cause was by neutralizing the manifest hypermetropia, and knowing the amount of latent that lay concealed, to keep pace with its development from time to time until all became manifest. And much stress was laid on the supposed necessity of making the neutralizing glass as far as possible part and parcel of the eye, only to be laid aside when the eye "ceases to see." These views have recently been subjected to important modifications, and the assumption that moderate use of the accommodation on distant objects can not be indulged in without injury, has been proved fallacious. Considering, therefore, the inconveniences arising from the constant use of glasses for all purposes, and the state of dependence on them to which the wearer becomes finally reduced, we may allow a patient who sees distant objects moderately well without assistance, to content himself, temporarily at any rate, with the use of glasses for the near.

Dr. Williams (of Cincinnati).—The experience which I have had for a number of years with this class of cases has been considerable, and I have found a number of patients where I had, by careful and repeated examinations, excluded all idea of the usual causes of asthenopia, such as myopia, hypermetropia, astigmatism, and paralysis of accommodation, and still found cases that, notwithstanding the sight was perfect, the range of accommodation normal, and the eyes ophthalmoscopically and in every other respect perfectly natural, still the patients were not able to use their eyes for any length of time without feeling great inconvenience. But I have generally found in these cases that before coming to me they have consulted physicians frequently, and have been invariably told that their symptoms were those of approaching amaurosis—and the patients having a horror of that, think they must not use their eyes. Thus they regard the non-use of their eyes as an absolute necessity; and go on using them but very little, feeling always a terrible apprehension that they will eventually become blind. Of course their eyes, under such circumstances, do not get any better. I believe that in all these cases the disease is seri-

ously aggravated by the mental apprehensions of the patients; and I make it a point in their treatment to make a careful and thorough examination, so as to be able to satisfy myself whether there is any disease that is likely to destroy or seriously impair the vision. If there is not, I assure the patient, in the most confident way possible, that he need not have any apprehensions about being blind. I usually tell him he could not get blind if he were to try. I endeavor to get the confidence of my patients in that way, so as to relieve them of the apprehension. I know, from my own individual case, the effect of relief of that apprehension. Years ago, as a student, I was in the habit of using my eyes a good deal at night, frequently reading till one or two o'clock in the morning—sometimes in my bed for several hours; and, after persisting in this for several years, although I had remarkably strong eyes, they began to have symptoms of asthenopia—fatigue, pain, and sometimes an indistinctness of vision, produced, no doubt, by the temporary congestion of the choroid; and I can now, by looking at a white surface at this time, see the choroidal circulation upon my eyes. When I was at the clinic of Dr. Graefe I was troubled in that way, and was greatly apprehensive that I might eventually lose my eyesight, although it was still perfect. I asked him to examine my eyes with the ophthalmoscope. He did so, and told me that there was no appearance of disease; that there was no congestion of the retina; no organic lesions of the retina or choroid; it was just a little nervous irritation. (I don't remember the exact explanation he gave.) He distinctly assured me I need not be apprehensive of losing my eyes; and from that day to this they have been better without my having done any thing, except just to use my eyes a little more reasonably than I did before that time.

I have had this experience occur to me in the treatment of patients time and again. I remember one lady who had not read five lines of print, at one time, for twenty years. She had been told by all the physicians she had ever consulted that it was absolutely necessary for her to refrain from using her eyes; she would finally become amaurotic, and the less she used the eyes the longer the serious catastrophe would be delayed. As she was a little presbyopic, I told her she must use glasses. I had the greatest possible difficulty in getting her to look for a second through them. I told her the doctors who had treated her before had not understood the case; I was satisfied the glasses would cure her; and I fitted her with a pair of Number 30, convex, which relieved the presbyopia, and she has been using her eyes just as much as she pleased up to this time, and with very little inconvenience. In

the treatment of those cases which I have found in young men and young ladies, I have sometimes resorted to convex glasses, according to the directions of Dr. Dyer, without exactly knowing why. I have tried this mode in two cases—one a young lady, twenty-eight years of age, and the other a young man, twenty-two or twenty-three. I made them use their eyes with convex glasses whenever they began to read; and I insist on the regular, systematic use of the eyes in all these cases, always stopping short of fatigue, if possible; and by the use of moderately convex glasses I have found benefit, although there was no *hypermetropia*, and no paralysis of accommodation. I use first, as a sort of anodyne, a solution of sulphate of morphine. I use six grains to the ounce, a pure article, which generally produces but little if any irritation. I use it three or four times a day, put three or four drops in the eye, and give it time to take effect. Patients have experienced very decided relief from it. In addition to that I give them iron, or quinine, or nux vomica, or something of the kind. I give them regular, systematic exercise, and use the local application of cold water in the form of the douche to the eyes twice a day. I apply it with a small spout, the end being perforated; put it on the hydrant and let it douche their eyes for five or ten minutes; and I have sometimes had them relieved of great neuralgic pain; but the rule governing the application must be the strength of the eyes and the power to persist in using them. With these remedies the physician may begin with a strong assurance that the patients will not lose their eyes; I have generally succeeded in relieving them.

Dr. Delafield.—I should like to mention, in respect to this forced use of the eyes, that they should never be used before breakfast, and never when the patient is much fatigued. This is a very essential point to be observed.

Dr. Dyer.—My own experience has satisfied me of the necessity of observing this.

Dr. Williams (of Boston).—I did not intend to say any thing on this subject, but perhaps it may be well that all the corroborative experience should be brought to bear that we can bring with reference to this peculiar class of asthenopic cases; and all my own experience leads me to believe, with Dr. Dyer, in the importance of the systematic gymnastic exercise of the eye, as he terms it, and in the importance of making a good impression on the mind of the patient. My attention was very early drawn to these cases; before, in fact, I had any thing to do with them myself. I was so situated that I was constantly hearing about cases of successful treatment of what was called

morbid sensibility of the retina. Patients had been for a greater or less length of time suffering under that affliction, which is asthenopia, as Dr. Dyer has described it; and they had been subjected to rather an active treatment, and generally told to absolutely refrain from using the eyes at the same time. Local depletion had been used pretty extensively, and low diet insisted on. Many of these patients came to the charlatan to whom you, Mr. President, have alluded, and he put into their eyes remedies which had a perfectly surprising influence both on the mind and body. The patients were put to bed about twenty-four hours, after putting strong alkaloids on the eyes, and the impression made was astonishing. The patients considered the man a prophet, and ascribed the cure, which was in many cases effected, as coming through these remedies which he and no one else knew how to use. What were the real facts of the case? This man, who had a great deal of tact, took these hysterical patients and gave them roast beef and stimulants, let them take drives about the country and enjoy themselves as much as possible, taking away all their old associations. Whether he directed them to use the eyes or not I can not say. He placed them in circumstances different from those in which they had been placed, and he altered absolutely the general treatment. His patients did extremely well, and the observations I had of some of them, who afterwards came under my care, was, that he ascribed much more importance to the general treatment than to the local applications, which were of this agonizing character, and which, I believe, were used more to make an impression on the patient than on the disease. It answered the purpose in making an impression on the disease, however, by acting through the minds of the patients. Having this first brought very prominently to my notice, and observing the cases as they began to come under my own care, I was satisfied that his patients were, many of them, suffering from dread that they were to be blind. Feeling an inconvenience in using their eyes, and feeling they would "strain the eyes," as they termed it, and grow gradually blind, they followed readily enough the advice given them, and that was to refrain absolutely from using the eyes, sometimes with the advice to shut themselves up in a dark room. On examination with the ophthalmoscope, I did not often find the slightest tendency to amaurosis; and I encouraged the patients to use their eyes all they possibly could. I told them there was no tendency whatever to blindness, and they could use the eyes to advantage rather than leave them entirely without exercise; that they needed exercise for developing the eyes as much as any other organ, and that to be de-

veloped they should be kept in constant use. I found it important at the same time to give them tonic general treatment, and especially to caution them, as many of them were persons with delicate organizations and health, against an imprudent amount of exercise. I told them to take exercise regularly and frequently, and to divide the exercise, not taking so much at one time as to become thoroughly prostrated; for it seemed to me that the general nervous prostration which ensued on excessive exercise prevented the eyes from getting along well. I agree with the observations already made as to the use of the eyes before eating. It is also very desirable that patients should not use them when suffering with illness, or at the menstrual period. I found out, before knowing much about hypermetropia, that glasses, in a certain number of cases, answered very well. I mean that glasses were of more use than merely to give them encouragement in using the eyes. I gave them glasses which I tested carefully, and fitted to the eyes as well as I could, and they went on better; but in a considerable number of cases these were only valuable where hypermetropia existed, as we now recognize it. The patients were required to use the eyes by encouraging them, and by giving them tonic general treatment, and placing them in circumstances cheerful and hopeful; so that, instead of having the attention constantly fixed on the idea of blindness, and filled with morbid fear of it, they were encouraged to believe that they never would be blind; they might use the eyes some, and gradually more and more.

Adjourned to 2 o'clock, P.M.

AFTERNOON SESSION.

The President, Dr. DELAFIELD, in the Chair.

Dr. SANDS.—If this discussion of the question of asthenopia is still in order I will make one or two remarks, although I do not suppose I can say much to elucidate this difficult subject. But my experience has included several cases that come under the second category mentioned by Dr. Derby, one of which interested me very much on account of its obscurity and the difficulty I had in treating it. The case was that of a young gentleman, about seventeen years of age, living in New England. He had been sent abroad by his father to

complete his education, and to spend a couple of years in Europe. He was at that time in the enjoyment of perfect health. Having made the tour of the Rhine and spent two or three months in Switzerland and the neighboring country, he returned to Paris, and then began to experience pain in using his eyes. He had never been a very hard student, and was not over-working his eyes at the time. He was exceedingly surprised at the occurrence of the symptom mentioned, and went to a well known oculist in Paris, who, upon examination, told him he was suffering from hyperæsthesia of the retina, and that the affection had been brought on by the previous habit of masturbation, which, I think, he had indulged in up to that time, though never to any great extent. The physician created an immense amount of alarm in the mind of the boy, and placed him under treatment of a complicated character, a great many remedies being prescribed, both externally and internally. He was enjoined to relinquish the use of his eyes, and under no circumstances to apply himself to work in less than a year. This intelligence was communicated to his parents at home, who received it with a great deal of disappointment, and sent for him to return. Upon his arrival, I was consulted. I had supposed that perhaps the asthenopic symptoms might depend upon the existence of hypermetropia. On examination, however, I detected a very slight degree of *myopia*—I think, one-fortieth; the power of accommodation equaled $\frac{1}{4}$, and vision under no circumstances was indistinct. He did not have the blur of which hyperopic patients, who are suffering from asthenopia, usually complain. He referred the pain to the ball of the eye rather than to the supra-orbital region. I could discover no evidence of disease by ophthalmoscopic examination, except a small amount of capillary hyperæmia in the optic nerve. The sharpness of vision was normal; I believe it was a little above the normal, for he saw No. 20 of Dyer's test type at a distance greater than twenty feet. This young man's physical health was good; his mental condition, however, was one of depression, induced, I think, by the advice given him when he was under the care of the oculist in Paris. I did all I could to encourage him, and assured him that he would recover. I was satisfied that he had no disease of the fundus, and no insufficiency of the internal recti. Having read an account of some cases by Donders where asthenopic symptoms were ascribed to inordinate contraction of the ciliary muscle, I was inclined to suspect that this might possibly be the cause of my patient's symptom. He suffered no pain when looking at distant objects, but only when the ciliary muscle was brought into play during the act of accommodation. I

provided him with convex glasses of twenty inches focal distance. I hoped that by this means he would be able to relax the greater part of his accommodation, and in this way get rid of his painful symptoms. But when the optic lines were made to converge upon near objects, it was about as painful for him to suspend his accommodation with the use of the convex glasses as it had previously been to exert it without the glasses. Donders relates several cases in which asthenopic symptoms depended upon spasmodic contraction of the ciliary muscle, and in which complete relief followed the instillation of a solution of atropine sufficiently strong to wholly paralyze the accommodation and set the ciliary muscle at rest. It was found necessary, in one instance, to maintain the action of atropine for a period of six months before a cure could be affected. Meanwhile, the patient was allowed to read by means of convex glasses of suitable strength to compensate for the temporary loss of accommodation. These facts, I think, would lead us to look for an explanation of asthenopic symptoms often rather in the apparatus of accommodation, in the ciliary muscle and the nerves which supply it, than in any error of refraction or any disturbance relating to the general health. I have not yet tried the effect of atropine in the case I have related, as the young man is no longer under my observation.

Dr. Noyes.—The discussion in which we have been engaged has been to me personally very interesting, and doubtless to those of us who have to meet cases of asthenopia the explanation of these puzzling cases, or any light thrown upon their character, will be the information which we are most desirous of receiving. The discussion has thus far related chiefly to one class of asthenopia. I think it will not be amiss cursorily to run over some of these diseases which, in the general classification of medical men, are included under this name of asthenopia. Turning this morning to the definitions of asthenopia as they occur in some of our recent standard books, in an edition of McKenzie, the last published in this country, I found his definition of the term to be, "Incapability of sustaining the eye in adjustment for near objects." Lawrence, without exactly defining the term in a formal manner, gives these words, which I take as his definition: "An affection of the retina from excessive employment, commonly called weakness of sight." McKenzie grouping the symptoms round adjustment to near objects, and Lawrence grouping the symptoms round simply a morbid condition of the retina. Turning then to the treatise of *Stellwag von Carion*, his definition of asthenopia (and he has an

admirable practice of formally defining the disease which he is about to discuss) includes :

First, " The inability to keep the dioptric system or the visual lines for a long period directed to near objects; and, *secondly*, in close pathological relation to this condition hyperæsthesia of the retina and ciliary nerves."

This definition of asthenopia is unquestionably the definition which we would be most likely to adopt; but at the same time I think there is a great tendency to exclude from the definition of asthenopia all those cases of refractive errors and muscular disturbances which are not properly disturbances of the ciliary muscle, and to include under the term of asthenopia, or *hebetudo visus*, cases in which neuralgic symptoms predominate. This is the meaning which the term is gradually assuming.

But a glance at the literature of the profession shows that such was formerly not the understanding of asthenopia, and we all know perfectly well that at least two or three well recognized subdivisions can be made. First, errors of refraction principally, or hypermetropia and astigmatism. Second, insufficient power of the internal recti muscles: they can not perform their work of converging the visual lines when the eyes are engaged upon near objects. Again, thirdly, there is another set of cases characterized by excessive irritability of the retina, and accompanied by ciliary disturbance, or neuralgia of the eye. They suffer from extreme intolerance of light; and examination by the ophthalmoscope, as far as it can be permitted, will discover no lesion, no organic change; and that there can be no morbid change is corroborated by the fact that their visual power attains the normal standard. It is not for me to say any thing on the subject of hypermetropia, or astigmatism, or myopia; it would be a piece of supererogation. I only desire to recall these facts, in the form of historical reference. Then, as to the insufficiency of the internal recti muscles. This unquestionably has a nearer relation to the subject of asthenopia, in the aspect in which we are now disposed to view it, than do the simple errors of refraction; because this muscular part requires to be exerted in all use of the eye upon near objects. The accommodation of the eye and muscular convergence are inseparably connected. We are all aware that the correction of this difficulty is to be accomplished in one of three ways: either by the division of the *external recti* muscles, by the use of prisms, or, what has been a very recent suggestion, the employment of electricity, acting directly on the internal recti muscles. Of this last I

know nothing, with the exception of what is contained in the last number of the *Archives für Ophthalmologie*, by Dr. Landsberg. As to the division of the external recti muscles, I have performed it in only a very few instances, and only in cases where the amount of insufficiency was so very decided as to require a prism of fourteen or sixteen degrees to enable the patient to see near objects, and in these cases the results are sufficiently satisfactory. As regards the employment of prisms, and keeping them constantly in use, my experience has not been very large. I have never ventured to employ prisms whose angles were higher than an aggregate of eight degrees. The dissatisfaction which patients expressed was sufficient to prevent me from pushing the experiment with higher degrees. With prisms of four and six degrees I have found decided benefit. I have found that where the deficiency was confined to but one internal rectus, the correcting prism must, as it were, be divided, and one-half be placed before each eye.

I have been compelled, as I mentioned to some of the gentlemen here in New York, some time ago, to look for a readier method of discovering insufficiency of the recti interni than has hitherto been practicable. The means proposed by Graefe, viz., by looking at a vertical line with a round spot on its centre, was the foundation of the examination; and I discovered that I succeeded better in taking a piece of black paper, and drawing a white line and dot on it. Across the middle of the line, and at right angles to it, I draw a dotted scale, divided into eighths of an inch, and numbered each way from the centre. The white dot is at the intersection of the vertical line and the horizontal scale. As usual, a prism of about 10° is placed with its base upwards or downwards, before one eye, and a disk of red glass before the other. If now there be insufficiency of the interni, the patient sees two lines as well as two dots; one of these lines decidedly red, and the other nearly white, fringed by chromatic aberration. The difference in color is enough to attract his attention much more quickly than by looking at a black line upon a white surface. The scale, moreover, enables the patient to describe the degree of separation. I have, with this diagram, saved myself the loss of much time. I could never before easily get patients to understand what I wanted them to do.

Dr. Dyer states that he prescribes weak convex glasses to asthenopic patients, with normal refraction, for the purpose of altering their *relative* accommodation. In other words, not for the purpose of diminishing the amount of accommodative effort by the aid of the convex glass

—for example, subtracting $\frac{1}{36}$ from $\frac{1}{12}$—but to cause their accommodation to act under a different angle of convergence. He calls into play the intimate association subsisting between the internal recti muscles and the ciliary muscles. The convex glass brings the near point a little nearer to the eye, and requires a little greater effort of the internal recti. In this way, perhaps, a good influence is exerted upon the ciliary muscles. They may, perhaps, be said to have a "better purchase" in their contraction, while the systematic training developes their strength.

I have seen benefit derived from wearing weak prisms, in cases where I did not feel certain that the internal recti were at fault, but in whom asthenopia was sufficiently distressing. I have combined a prism of two degrees with a convex lens $\frac{1}{36}$, and thus relieved a very troublesome degree of asthenopia. With these contrivances, there occurs a change in the relative accommodation. Certainly not the change produced by simple convex glasses; but yet the eyes accommodate, under conditions unlike those to which they have been accustomed. I have, in some cases, doubted whether the benefit derived from prisms was because of the relief to the internal recti, and not rather because of the modification in the conditions of accommodation. Before leaving the subject of the use of prisms, I would remark, that some patients, using prisms of only two degrees each, have complained of the spherical aberration. A physician, accustomed to use the microscope, and a draughtsman, both asserted that the page comes up to them in a convex surface. After my attention was drawn to the phenomenon, I myself became conscious of it. I think it curious, and am not prepared to suggest an explanation. It is not strictly spherical aberration, but is a loss of flatness of field, a sort of pseudoscopy.

If you will permit me to have a word to say in regard to cases to which I think the term hyperæsthesia of the retina may properly belong, the subject may be illustrated by three cases which I distinctly remember. Two of these were in the persons of physicians. One of them, a surgeon in the navy, had been stationed on the African coast; had been subjected to the intense light of the tropics. His eyes became extremely sensitive to light, and he not only could not use them, but was rarely free from ciliary neuralgia. He had subjected himself to all sorts of treatment, almost poisoned himself with strychnine, had used quinine, adopted all the local applications which his knowledge and study of what was written on the subject could suggest. After he had been suffering in this manner for about five years, he came under my observation, and, on examination, I saw there was no departure

from a normal structure, and no deficiency in the power of accommodation, or of any other function. I could assure him that he was in no danger of becoming blind; that he would probably, ere long, be better; advised out of door exercise, and avoidance of the use of his eyes and of bright light, and gave him blue glasses. Under this encouragement, by general management, after being on shore six months, away from the irritating influences to which he had been subjected, he recovered the use of his eyes and again went to sea. There is now living in the city a physician who has the same misfortune. He came to me for a certificate, to be presented at the provost marshal's office. I made an ophthalmoscopic examination, with as little gas-light as I could get along with, and it produced agonizing pain for twenty-four or forty-eight hours. It was always the case that the attempt to read, or to fix his eyes upon distant objects, as well as near, provoked extreme pain. There was no error of refraction, impairment of vision, or muscular disturbance; the general health fully up to the average. I could regard this case in no other light than one of extreme irritability, whose starting point was the retina, and which was reflected upon the ciliary muscle and nerves. One other case, of a similar sort, has presented itself to my observation. These are the several categories which present themselves under the title asthenopia. They will hereafter be known by their proper designations of errors of refraction, debility of the internal recti, hyperæsthesia retinæ. The term asthenopia is at the present time, when used to designate a distinct disease, and not merely a symptom, being narrowed down to cases of ciliary spasm, or neuralgia.

Dr. Althof.—I have not much to say in addition to what these gentlemen have very ably exposed to us. I have only to remark that so far as the treatment of cases of asthenopia by glasses is concerned, it is a subject which is becoming from day to day more important, and I have no doubt that if we had the same facilities in the city of New York that are had in Europe for providing our patients with glasses, we could use them to very great advantage in many cases of asthenopia where now we can not. So far as this graduated table which Dr. Noyes has prepared and exhibited is concerned, I have used a similar contrivance for a time, but have not found any great advantage from it. It is not easy to be used while examining a patient for insufficiency of the internal recti. I am suffering from a very high degree of this difficulty in the right eye; there is a divergence of two and a half lines. I am utterly unable to produce the double images. With the

aid of the colored glass which has been used for a good length of time —which I have seen used as far back as 1858—I have always been able to bring those persons that are not very much accustomed to giving correct statements about their eyes, to something like a decent statement respecting them. I have heard, this morning, in regard to asthenopia, very little that I have not before read in the books of the great authors. The only thing I have heard which was entirely new to me has been contained in the remarks of Dr. Dyer—that portion relating particularly to the use of concave glasses. The suggestion of Dr. Dyer, as to the employment of a kind of gymnastic exercise of the eye, has for some time been known to the profession, but the exactitude with which he forces his patients to do exactly what he wants them to in observing his directions about their eyes is entirely new to me. I have never been able to do it, and I am pleased to learn that there is a way of reaching this result—a thing which, as I stated at a meeting of the New York Ophthalmological Society, has puzzled me extremely. It is very difficult, as I have said, to find out whether or not people are really suffering from insufficiency of the internal recti. I myself belong to this class, and if I were examined by a very skillful oculist, I think he would be puzzled to find it out—to know that I am squinting divergently to a very considerable extent. I have all the symptoms of insufficiency of the internal recti, without being able to produce the double images which ought to accompany the squinting. Dr. Dyer has stated that by giving persons concave glasses which enabled them to read at about fifteen inches, he has been able to relieve a good deal of suffering. I should like to know what method Dr. Dyer has adopted to satisfy himself that in these cases there certainly was no insufficiency of internal recti. The treatment of insufficiency of the internal recti by concave glasses is a thing which Graefe has exposed in that first paper of his, if I am not mistaken, in which he speaks of the three different classes of asthenopia—alludes to cases of asthenopia to be ascribed to insufficiency of the internal recti; and, particularly lately, a good many cases have come under my observation in which I have only been able to satisfy myself that this insufficiency of internal recti existed after very long and careful examination—three or four of them. I would be very much obliged to Dr. Dyer if he would tell me if his examination has satisfied him beyond any doubt whatever that the patients in these cases, in which he relieved them by giving them convex glasses, were not suffering from insufficiency of the internal recti. As to the suggestion of Dr. Sands, to apply a convex glass to an emmetropic eye,

it would be only substituting one evil for another, and I can not agree with him. It is an old experience, and has been admitted by all the authors who have so far advanced our knowledge in the structure of accommodation and refraction. They never, under any circumstances whatever, are able entirely to paralyze their accommodation. A man who has presbyopia, who, instead of reading at eight inches reads at twelve, you give him glasses one twenty-fourth and you will never find that he reads at eight inches; he will read at nine or nine and a half inches. So far I am sure; Dr. Dyer gives his emmetropic eyes a convex glass; they all do what he wants them to do—that is, they exercise a certain range of their accommodation; they do not really read in one point, but they do really use a certain fraction of the whole width of their accommodation. So far as the using of concave glasses for myopic eyes is concerned, I should like to have Dr. Dyer answer whether there was any insufficiency in all these cases.

Dr. Dyer.—I am very happy indeed to answer this question. I have no particular method of determining whether there is any insufficiency of the internal recti, besides those commonly used. I am never satisfied with the first examination; I always try both eyes successively and come to the best conclusion I can; if I can not determine it, I take it for granted that it is not there, although I am perfectly aware of the difficulty which Dr. Noyes and Dr. Althof have expressed—the difficulty of determining it when the person is not particularly educated or bright. The point that I wished to bring before the society, and the one that I wished particularly to have discussed—an idea which I am not competent to explain, though I have been working on it in giving glasses to these people—is this: that there is a want, a deficiency, of the relative accommodation, or a discrepancy between the power of the internal recti and the ciliary muscle; and if that is altered, and the hypermetropic man has a convex glass given him, of course the range is altered. But it is the same with the myope. That is one principle I have been working on, and endeavoring to establish a more perfect relation between the two.

Dr. Althof.—Mr. President, I was far from believing that Dr. Dyer had not taken every pains to ascertain the real state of the eye muscles in the cases of myopic patients to whom he gave concave glasses. As I stated before, I am very glad indeed to have heard the point introduced in the way it has been to the notice of the society, for I am very glad of having the opportunity of trying some remedy for cases which I have given up as incurable by me. As to the allusion made by Dr Noyes to the article by Dr. Landsberg in the last

number of the *Archives*, I for my part do not believe that any very beneficial results can be hoped for from the use of electricity. It is at least nine years since a physician of Berlin, one of our most experienced physiologists, communicated to the society of Berlin his ideas on the use of electricity in diseases of the eye. I recollect myself having seen in his house cases sent by Graefe, and I have seen any quantity of cases treated by electricity in Berlin; I have seen plenty of them in Vienna under the care of the now rather celebrated electrician, Dr. ——, but I have never seen any benefit whatever derived from the use of it.

Dr. Jeffries.—Mr. Chairman, I did not intend to say any thing on the question of asthenopia, thinking my report already presented would be sufficient; but, just before leaving home, I received one of the English journals in which the physiology of the ciliary muscle, and also its anatomy, are discussed in such a way as seemed to me very extraordinary. The whole of the experiments of Donders, Helmholtz, Ludwig, and every other eminent physiologist, and their conclusions with reference to the change of shape of the lens as indicated by the images reflected from its anterior and posterior surfaces and from the cornea, are all set aside. The article referred to is in the last number of the Ophthalmic Review, and was written by Dr. Henry Lawson. I was surprised to find such a piece in this journal, which is supposed to hold a high position in the department to which it is devoted. The author has fallen into an error in drawing from analogy (which never proves any thing) after experimenting with the eye of the emu. The idea is, that the ciliary muscles bend the cornea, make it more convex, and elongate the eye. I should infer from that part of the article relating to the anatomy of the muscle, that the one who wrote it entirely neglected to take notice what that muscle is. The circular fibres were discerned by Müller and by Arlt at the same time, without any correspondence between each other, and also by somebody else. Arlt did not assume that the function of accommodation rested with the ciliary muscle, but with the four recti muscles. It was with the idea of sustaining his theory that he went to work very carefully on the eye itself. I saw his way of going to work—the faithfulness with which he investigated every thing. He has given us the anatomy of the muscle very faithfully and very perfectly.

[Dr. Jeffries explained, by the use of a figure on the blackboard, the anatomy of the muscle, and proceeded to criticise the article in question.]

Dr. Dyer.—There is a short matter, Mr. President, disconnected

from the subject that has been discussed, relating to the facilities for accurately determining astigmatism. I find there is a practical difficulty in using the lines which Snellen has given us, and the difficulty seems to be that the lines are too thick for their length. I divided the square into a greater number of lines, dividing them, however, in the same manner, and making them horizontal or perpendicular, one corresponding to each of the test letters—20, 40, 50, etc. I find them very useful. I have determined it with patients who were suffering from actual astigmatism, and by observations I have had with persons made astigmatic with cylindrical glasses. I here exhibit a drawing intended to illustrate it—one made with water colors, which, by the way, I am not in the habit of using. I intend to have this printed soon.

Before sitting down, however, Mr. President, I wish to relate a series of experiments which I have been carrying on, unsuccessfully, however; but a description may interest some of the members of the society and induce them to pursue this investigation. It occurred to me that if a lens were colored alternately blue and yellow, that with an astigmatic patient the effect of these ought to be green, on the same principle that a wheel painted in alternate sections yellow and green ought, on being revolved, to exhibit green. I find they do not, however; they look more like gray than any thing else. I tried it with a great many patients, both those that were astigmatic by nature and those made so artificially. I have tried various shades, various thickness of the lens, various differences of distance between the lines, tried them with oil colors, water colors, and with crayons. I have pressed several artists into the experiments, but the result has been absolutely and entirely unsatisfactory. Theoretically I can not see how it is.

The committee on the nomination of officers for the ensuing year then reported the following as their nominations :

For President, Dr. Edward Delafield, of New York.
Recording Secretary, Dr. Henry D. Noyes, of New York.
Corresponding Secretary, Dr. Herman Althof, of New York.

Which report was unanimously confirmed.

Adjourned to meet at Boston, Mass., the 2d Tuesday of June, 1866.

SPECIALTIES IN MEDICINE.

By HENRY D. NOYES, M.D.,

Surgeon to New York Eye and Ear Infirmary.

READ BEFORE THE AMERICAN OPHTHALMOLOGICAL SOCIETY,

JUNE, 1865.

John Medole, Printer, 4 Thames Street, N. Y.

SPECIALTIES IN MEDICINE.

In every subject of scientific study the progress of investigation and the accumulation of knowledge must reach a point where it becomes a serious task to master all its facts, or to be acquainted with all that has been written about it. When a great number of zealous observers are bending their energies in a common pursuit, it happens after a time that not the oldest and most eminent among them can possibly attain to a perfect acquaintance with all that is known about it. For example, the ardor of geologists during fifty years has amplified the science until it can hardly be expected of any that he shall be conversant with all the details of the earth's mass and structure. Among botanists, no one can enumerate the entire flora of the world and their minute peculiarities. What chemist can exhaust all the facts of his great study in a statement perfectly comprehensive, and without omission of details?

From the extension of knowledge, as well as from the brevity of life, and the limited capacities of the mind, investigators have been compelled to limit their researches to small portions of their chosen field if they would contribute anything valuable to the stock of facts. In short, not only is it impossible for one mind to gather to itself the universum of knowledge within the usual period of a lifetime, but even in particular branches of study the task has become so heavy as to be beyond human attainment. The well-known anecdote of Newton need not be quoted. It is not to be denied that some men obtain extraordinary success in grasping a multitude of facts, and in reducing them to systematic and logical order. They are the master minds of their age, and

their names will be enduring as human memory. But gifted men, like Erasmus, Bacon and Humboldt, are the astonishment of mankind, and were we obliged to wait for their advent in the cause of science, the accumulation of knowledge would be at the rate of progression in geologic eras, while the mode of progress, instead of being by gradual accretion, would be an alternation of long and dreary ages of stagnation with brief times of dazzling splendor. Such, however, is not the order of things. The processes of nature and the growth of human knowledge are alike.

Increase is by slow additions, by patient and pains-taking observation. A multitude of workers, each bearing the little burden which he has gathered from the path where he has wandered, cast in their contributions, and as the decades pass the stately pile of human knowledge creeps upwards; it slowly assumes harmonious proportion, broadens its base, and lifts its soaring height. The rising of an ant-hill, the building of Cheops, in one sense are typical of the increase of science; but these limited and finite models are far from being perfect representatives, for science is the gleaning of gems from the exhaustless mines of knowledge, whose storehouses are the recesses of the infinite mind; to neither may we venture to set bounds.

If, now, this be the way in which science advances, how is it in the applications of science to useful art? By useful art I mean the adaptation of scientific facts and deductions to the uses of mankind. Can practical application go on in advance of the discovery of data? Can implements be made without material? Can fabrics be woven without both material and implements? Useful arts can, therefore, make no more rapid development than science. In fact, art is usually behind science by long stretches of distance, and these sometimes so great that the popular voice, not discerning their mutual dependence, sometimes clamors against science as dreamy and unworthy, because it seems useless. Science is its own justification; it needs no defence any more than *truth;* the one is synonymous with the other. But the mass of mankind are most concerned to secure the comforts and benefits of useful arts. The needs of the body, the happiness of society, must be provided for.

Men have a right to demand of science that she do not shut up her treasures as ore in the bowels of the earth, but freely yield them up to be fashioned into implements for useful labor and to minister to the welfare of the race. Humanity and benevolence enter with authority to compel the assent of science to their mandates. The air, the earth, the sea, must contribute to soften the hardships of social condition, to cure the sicknesses of men, to soothe the pains of dissolution.

This brings us to the subject of medicine. It is both a science and an art. As a science, far in advance of its early beginnings, yet mayhap as far yet from its ultimate perfection as from its primeval state. As an art its efficiency and success depend upon the fullness and clearness with which its facts are learned and logically systematized; upon the memory and readiness of the practitioner; upon the skill of his manipulations; upon the fertility of his inventive and adaptive power; and upon the keenness of his senses, touch, sight, hearing, &c. To successfully practice an art, demands first the careful study of science and also the education of the individual; or, as I may express it, taking the practitioner in the sense of an instrument, he must be fashioned into shape and fitness in both mental and physical qualities, before he can deal with the facts of science in their application. To make a fabric for wearing apparel, science must discover the crude cotton, silk, or wool, and prepare it for use; while art must invent the weaving machine and bring it to perfection. The physician possesses himself of facts furnished by science, which are his raw material, and then proceeds to qualify himself to apply them to his healing art.

In the economic arts it may matter little if there be a wide discrepancy between the advanced state of science and the clumsy appliances which utilize it. Convenience and luxury may be lacking, but perhaps nothing more. In the art of medicine there must be no such discrepancy. Human woe and bodily privation, the loss of health, the loss of the senses, and the loss of life are the subject matter of this art. Here there may be no lagging behind the front line of scientific attainment; the very fore front is where the disciple of the *ars medendi* must place himself and remain. He has no business

in the rear; he is recreant to himself, recreant to humanity, recreant to duty and to religion, if he voluntarily stay behind in the onward march of medical science.

There frequently occurs among noble minds a sore conflict between the demands of pressing labor and the monitions of conscience and of the sense of duty. As such an one, to the best of his skill, administers to the distresses of men, he fears that his mind may not possess all the facts which late investigation has afforded upon this or that case; or that his hand may not wield the knife with the correctness and skill which other men have acquired. What practitioner of twenty years' standing has not felt this burden? What *young* physician in his first years has not been harrassed by the fear that he is not doing justice to his patient, because he may not be fully competent in the knowledge of the case? To what purpose is our medical journalism, but to furnish to the anxious, waiting practitioner the latest facts, discoveries and appliances, to be at once seized for the good of our patients.

But is any medical man bold enough to say that he has sufficiently explored the records of the past; has stored his mind with all the wisdom of recent years, and is every year up to the level of modern science, so that he comprehends within his grasp all of science, and can apply his art with the highest human skill? That no case can be presented to him in which he cannot offer the best and soundest advice possible among the medical profession? Can settle a diagnosis with a precision which no other can excel? Can do an operation with a dexterity inferior to no other? Such perfection of skill and knowledge no man will venture to affirm for himself. The assumption would to his fellows be the strongest evidence of his imperfections.

As decades pass and science and art attain greater completeness, the labor of the physician in fitting himself for his profession becomes more and more heavy. As life advances and business multiplies, his disposable time for study of both his own and of other men's labors becomes less and less, until it may be reduced to the merest fraction of the day. In the laborious rounds of practice among thinly peopled districts, in the hurry and press of large practice in cities,

medical men strive manfully to keep up their knowledge of how the world of medicine moves on; but too often they are the first to accuse themselves of being unable to meet the duties of their daily calling, and keep *au niveau* with modern improvement. And it will be observed that the men ready to make this confession are or have been the most studious, the best qualified, the most conscientious practitioners among the community.

In actual fact, regarding the practitioners of medicine as we find them, does not every one know that but very few of them possess the highest fitness which medical knowledge and skill can reach? This is largely due to defects of education, both of an academic kind and in the schools of medicine. Men are often compelled, by the need of getting a livelihood, to enter practice, feeling themselves yet very inadequately prepared.

Want of fitness at the outset of medical life must to a greater or less degree be affirmed of every one. Youth cannot claim the attributes of age and experience. If in this regard the young doctor is at a disadvantage, neither on the other hand ought the standard of medical attainment to be purely theoretical and transcendental. It must be such as the wisdom of experienced and practical men deems needful. It must fairly represent the present; it were folly in imposing medical qualifications to seek to discount the future.

All medical men agree in seeking the growth and improvement of their art. All admit that its science should steadily and unfalteringly move forward. All will admit that the art cannot in any large sense move onward faster than the science, and that the true way to better the art is to enlarge the science.

Do all medical men, or many medical men, bestir themselves to add to the science? Do they keep notes of facts? Do they inquire into remote causes? Do they investigate collateral branches of knowledge? Do they publish to the world all their valuable observations and deductions? Every one knows the answer. And why? Mainly, want of time; perhaps want of inclination. Wide diffusion of their explorations frequently prevents them from following out any one line of investigation to complete and valuable results. Herein is the un-

doubted disadvantage of being what is called a "general practitioner." He is busy in laboring at medicine as an art, and cannot readily pursue those investigations with the microscope and the test tube, and in the laboratory, to which the phenomena he observes invite him; nor can he keep proper record of the facts which come before him. This is no disparagement to general practitioners; it is the unbending necessity of their lot, and the misfortune of science. Many a man, a willing votary of science, deplores that so swallowed up is he in the cares, the labors and the hurry of practice, that neither energy nor time remain for the quiet pursuits to which he would gladly turn. Could the human frame endure heavy encroachments on the hours of sleep, and this for long periods or a long life, what rich contributions would multitudes of general practitioners bring to their science. This unhappily is impossible, as many an overwrought brain discovers.

The hard labors of medical life, urged with an imprudent zeal, are too often stopped by death; the man fitted mentally to do most and best, feels keenly the brevity of every earthly career, and strives, by diligence too great for human endurance, to make life most fruitful; but often his harvest is blighted, because the great reaper puts his sickle into the laborer's field.

To sum up what has thus far been said—the development of medical science and the improvement of medical art are hindered by the magnitude to which the science has attained, by the inability of practical physicians to bestow on scientific research the time and labor which are indispensable to the best results. The preparatory work in the study of medicine is so great, if adequately done, that but few can spare time for its thorough performance, and men must become practising physicians to support themselves.

Disadvantages of early professional education of course become a clog upon a man's usefulness in his art, and they almost preclude him from doing anything valuable in scientific labor. In early life, inadequate qualification; in later life, the want of time to be spared from pressing duties, and the waste of energy in their performance, result in disqualifying physicians from aiding in the rapid advance of their chosen science and the perfection of their art.

The man of ripe experience, who all his life has been a keen and exact observer, who has made himself a judicious and skillful practitioner, is sought for by the whole community to heal their infirmities—but full of labors, he can communicate his results and opinions only to the patients whom he advises, and to the physicians with whom he comes in personal contact. He dies, and the world loses forever knowledge and practical wisdom, which, stored in books, might for ages bless mankind. He has had no time to write. He served well his day and generation, but the future will owe nothing to him; after his immediate friends and beneficiaries have ceased to utter his name, and are in turn removed from time, society becomes oblivious of him. The tombstone only reminds of a lost treasure, and turning its back on what it cannot recall, the world pushes on to achieve its allotted tasks. Science observes and records as before, but has not written this man's name among the honorable roll of her laborers.

It may be remarked, that medical science differs from most sciences, in that those who investigate and promote it are, with rare exceptions, the very persons who apply it. Chemistry pursues the labors of the scales and the retort, paying little heed to the practical arts. The science of medicine deals with living organisms, and in their investigation requires the aid of many correlative sciences, but its facts and deductions must be put into immediate practice. Hence, in almost all cases, the investigator in medicine is also a practitioner of the art.

Can anything be done to render the practice of medicine more strictly in accord with the state of medical science, and to render the progress of medical science more rapid?

Two answers may be made to this question. First, medical science, it may be said, should be in the hands of those who may give themselves exclusively to its investigation, and leave the art to practising physicians. To some extent this has been done. A few names can be given of men who have dealt little with medical practice, and devoted their lives almost entirely to the scientific side of medicine. These men have been teachers in universities and professors in medical schools; they may

have been supported by governmental patronage, or, possessing wealth, have had rare enthusiasm in medical study.

But very few men can hold such places, and were the advancement of science to be given over to them, most of disease outside of hospitals would be lost to scientific study. This notion is on its face chimerical. Let me not, however, fail here to note the name of one now living, who occupies very much this unique position, and whose unwearied labors have already done so much and been so generally acknowledged in the world of medicine. I allude to Prof. Rudolph Virchow, of Berlin.

But a second solution of the difficulty presents itself. It is not of recent suggestion, while it might be urged that it commends itself to the good opinion of medical men, because it is being every year more and more generally adopted. This solution is the subdivision of the field of labor. This proposition, which has universally been accepted in almost all the affairs of life, in the economic arts, in manufactures, and, moreover, in other natural sciences, finds some difficulties in its application to medicine. These difficulties depend on the fact that, while medicine as a science, and considered abstractly, *may* be subdivided, like any other natural science—as, for example, into anatomy, physiology, pathology, and the functions individualized to any extent, when it is brought into use—these distinctions must, to a great degree, be ignored. The medical scientist is at the same time art-ist (if I may apply to the word a somewhat unusual sense.) The patient is a man; his whole organism is before us; it may be only partially diseased, but that part bears intimate relations to all other parts, and sometimes is inseparable from the whole. From this circumstance some infer that a subdivision of medicine is, in practice, impossible. The point of inquiry is, whether, *under some conditions*, a subdivision of medical science and art is not only possible, but whether it is not attended by extraordinary advantages.

What principle shall be adopted in drawing lines of demarcation and division across the field of medicine? No *a priori* consideration can be appealed to in such a matter. The only safe guide will be the teachings of experience. It might be said that the several functions of the body would be proper

subdivisions—for example, digestion, respiration, circulation, excretion, generation, innervation, the special senses, &c. To be sure this has in part been adopted, but respiration and circulation are usually studied together; innervation and circulation are both inseparably connected with all other functions; while excretion belongs both to the digestive and to the respiratory apparatus, as well as to the kidneys and skin. Both anatomy and physiology fail to give perfectly unobjectionable divisions.

The only guide will be to take those subdivisions which have in actual trial been shown to be practicable and advantageous. The following are some of the subdivisions or "specialties" which have been successfully made. Diseases of the brain, mind, and nervous system; long have these been isolated in the establishment of hospitals and asylums for the insane. Diseases of some of the special senses, the eye and the ear, and it may be remarked that there is no necessary connection between them, as many seem to think; the senses of taste, smell and touch have never been isolated in practice. Diseases of the teeth, long ago consigned to a special class of practitioners; diseases of the throat; diseases of the skin, including its appendages, the hair and nails; diseases of the chest; diseases of the genito-urinary organs, both in the male and in the female—the latter have been separated from the former. Midwifery has by some been exclusively practised, while only venereal diseases have been attended to by others. Furthermore, surgeons have in Great Britain divided themselves from so-called practitioners of medicine; this distinction is becoming universally acknowledged.

Besides all this, other subdivisions have been made, and which have been vaunted in a pretentious and unworthy manner, by persons claiming almost marvellous abilities, and guilty of most unseemly conduct. Such are the corn doctors, the bone setters, the electricians, the pimple doctors, the hair restorers, the pile doctors, &c. These men having been styled specialists, have caused a portion of the odium belonging to their evil practices to fall upon those who maintain an honorable position, while they cultivate only a limited field of practice.

This sentiment will no longer continue when special departments of medicine fall into the hands of right-minded men.

The object sought in specialties is the attainment of more perfect skill in practice and more rapid advance in science. That a higher perfection in art is thus made possible, is apparent form the great frequency with which cases of a similar kind are treated. The ear becomes sensitive to nice distinctions of sound; the eye instantly recognizes differences of form and color, and instinctively notes features making up the *tout ensemble* of disease, which eyes less familiar must slowly analyze and combine. The accustomed phases of disease are at once anticipated, and departures from their ordinary course arrest immediate and eager attention. Wise discrimination in the choice of medicine follows, as the necessary result of daily familiarity with its effects in particular cases. The practiced hand has learned to do its delicate and momentous work with unerring certainty, and with entire confidence in its own powers. Success vindicates the homely adage that "practice makes perfect," in results so brilliant, so noble, and so humane, that no one can gainsay its truth.

In promoting the growth of science do specialties offer decided advantages? The answer is, sound deductions may be drawn from the tabulation of a great wealth of cases. For example, the ratio of success in extraction of cataract may be taken from the results of more than a thousand cases done by one operator, Prof. Graefe, of Berlin. The annotation of cases becomes easier, because it can be greatly systematized and simplified. General features being thoroughly understood, data of time and peculiar varieties only need to be specially noted. The mind of the observer does not become distracted by being called in many and widely different directions; he cannot only inform himself of all the past of his specialty, but can in this limited field become perfectly cognizant of the present. Earnestly and constantly bending his thoughts on comparatively few problems, and gaining large opportunities for observation, the specialist has an advantage for making new discoveries and reliable conclusions far beyond one who sees fewer cases and can think less about them.

I have spoken of specialists, and have, perhaps, been sup-

posed to mean only those physicians who announce themselves as giving their attention to particular diseases, to the exclusion of all others. This is the generally understood sense of the term. But we all know that men who for years have followed general practice, often acquire reputation for skill in certain diseases, and come to addict themselves more and more to treatment of these, to the neglect of others.

Here is the vindication of my plea for specialties: the order of nature and of events has proved that it is wise to group diseases into classes, and useful to refer the treatment of them to hands which constant familiarity has rendered facile. The community find this out, the profession admit it, and do we not know the men who, in a particular district, will be consulted in diseases of women, of the joints, of the blood-vessels, of the eye, to be those who, if they repudiate the questionable honor of the name "specialist," are to all intents and purposes occupying the same position?

I come now to a vital point in this discussion. I have been arguing in favor of those who early in professional life set themselves apart from other practice, to the pursuit of a particular branch. That any man has an abstract right to do this none will question, nor does anybody challenge so plain a proposition. But the question is vital to the welfare and dignity of a noble and learned profession, which must jealously hold high its standard of intellectual attainment for those who seek entrance into its ranks:—what amount of knowledge should a specialist possess? May he know only that department which he calls his specialty? May he ignore all the rest of medicine? May he cultivate his specialty as a stone-cutter chisels his own block, and knows nothing of the grand edifice? May a man begin the practice of eye disease, of skin disease, of syphilis, without knowing anything, or only a mere smattering of the principles of medicine, or the theory and practice of all disease? Here will be found the dividing line between those who strive for honorable position among a noble profession, and those who seek only their selfish aggrandizement, and care for nothing so much as for money. Herein will be found the distiction sharply cut and cropping out between the members of a profession and the craftsmen of a trade.

With the latter, in the pursuit of useful and honest vocations, earning their daily bread, I have no fault to find, but render due praise and pay for work honestly done. But when I rise from the level of handicraft and mere manual labor, and pass to the ranks of the scholarly and learned, of the benefactors of the race, of those in whom men confide at their times of sorest need, I leave behind the contracted, the sordid, the selfish. The true physician seeks to enlarge his knowledge beyond the immediate confines of his profession—the specialist can lay no claim to honor and respect if he permit himself to shrivel into the scanty limits of his little shell, and know nothing outside its impenetrable crust. The specialist has no claim to be an honorable physician who has not first gained its degree by study and fair examination. He must be well educated in general medicine and surgery, and in all their departments; he should not only know them after the manner of the fresh graduate, but he ought to know them practically. He should, if practicable, seek this education in general hospitals. When thus made ready for the wide responsibilities of general practice, he is in position to choose a specialty if he list. In no other way can he become a fit specialist; no otherwise can he comprehend the dependencies and sympathies of the human organism. No part or organ can be isolated from the rest of the body in health; nor can it be isolated in the phenomena of disease.

The syphilologist must know all of human structure. The uterine physician cannot shut his eyes to the complex sympathies of the generative apparatus with all the rest of the female economy. The oculist must understand general pathology and therapeutics, because the brain, the circulation, the digestive functions, the kidneys, the uterine system, are all to be interrogated if he would comprehend the diseases which the eye presents. Nor may he forget the poisons, both animal and vegetable, which vice and indulgence or accident may inflict upon the body—syphilis, tobacco, &c.

Let the specialist take this ground, that he has mastered all the preliminary studies which every physician pursues when he sets forth in his career, and then let him add to this preparation the further labors of his chosen department, cultivated with

ardor, and to a degree which puts him in this particular qualification visibly above the attainments of his fellows, and he then need not fear a want of recognition and respect. His fellows in the profession must and will respect him. He is one of them; he never secedes from their ranks, nor will they have the least disposition to cast him out.

This leads to the inquiry, what are the relations of the specialist to the profession? and what attitude should each hold towards the other?

I have maintained that the specialist must be a well-educated physician, and I also maintain that he must not in any way hold himself aloof from the duties, the obligations, the courtesies and the proprieties which belong to the medical profession. He is jealous of professional honor—he is mindful of professional courtesy. He is none the less bound by ethical rules than are his brethren. His real position toward them is that of a *counsellor in difficult cases belonging to his sphere*. He claims a peculiar skill on one subject; when other practitioners need counsel in these cases, they ask for his assistance. They may simply call him in consultation, or they may turn the patient over to his care. In either case the specialist must govern himself by the rules which all medical men observe in holding consultations with each other.

Friction with his brethren may arise on two points: First, claiming to be a consulting physician or surgeon in his peculiar province for the benefit of his professional brethren and the community, the young specialist perhaps finds himself in an anomalous position; a counsellor who has no clients; a person claiming to be distinguished, but whose claim has never been admitted. Specialists have sometimes demanded, as their right, that they may advertise their pretensions in the public prints or in the medical journals. The former kind of self-proclamation is universally condemned by the profession, as an unworthy attitude for the member of a liberal profession to hold towards the community; none the less should it be condemned and abnegated by the specialist. Advertising in *medical journals* may be done as offensively as in any other prints; but when it consists simply in the announcement of name, address and specialty, it is difficult to see the offensive quality of

the act. It is but the tender of services to the medical profession, which they may accept or decline; they may or may not admit the specialist's claims to particular skill. I cannot conceive the impropriety of a specialist communicating to his *professional brethren* the fact of his practising in a special subject, and in that alone.

The question, how he may do this, may be one of expediency. If advertising in medical journals be permitted by local etiquette, none can find fault in it; if it be disallowed, he were an idiot to excite the disapproval of the profession. He must get at the profession by inoffensive means: he may send them his card under cover; he may seek out their individual acquaintance. If, by well-considered contributions to current medical literature, he display the reality of his claims to special regard, he will both make himself known to the profession and offer the best plea in his own favor. I must, however, disclaim advocating the insertion of crude or puerile papers, reports of cases which have in themselves no interest, and no purpose other than to serve the writer's personal emolument, under pretence of contributing to the welfare of medical science and the interests of the profession.

I hold the dignity of the profession to be as dear to the specialist as to any physician. I justify in him no loose morality, professional or otherwise, any more than in any brother of the order. It seems to me, however, that a correct understanding of mutual relationship shows that, to the general physician, it is a great help to be able to call in an emergency the services of a highly accomplished and honorable fellow, who may solve the doubt, may rescue the patient, may successfully achieve the difficult operation; and that, for the case in hand, it matters not whether this aid be rendered by one who is not ashamed to be called a *specialist*.

On the other hand, every specialist—and I speak emphatically in behalf of *young* specialists—knows full well that his best friends are brother practitioners not of his peculiar branch. If the general practitioner find advantage in using his skill, the specialist is indebted to him for the countenance he asks to commend him to the community, for the most valuable portion of his reputation, and for the direct patronage which he

bestows on him. I do not mean by this word anything servile on the one hand, nor offensively patronizing on the other. All men are mutually dependent; all arts, all sciences are kindred: all professions deal with the interests of humanity. In medicine all practitioners enter into noble competition for the general weal.

Acting on these principles, mindful of each other's rights, what jarring can mar the harmony between specialists and other physicians? The specialist must be careful, not even in his territory, to assume lordly airs; not to warn off all other men from his boundaries as rude intruders. General practitioners will and should treat all cases of disease which fall into their hands, for which they feel fully competent, provided that they do not permit ignorance of the current advancement of medical knowledge to create in their minds an unwarranted assumption of competence.

Specialists naturally belong to densely populated districts, to cities and large towns. They rarely flourish in small places. But they do not find a local practice; their name and influence extend over wide sections of country, and therefore they may easily avoid all jealousy on the part of practitioners around them, by the observance of the plainest dictates of fair dealing and professional comity.

This introduces a second point, to which I must allude, which has made unpleasant feeling against specialists. They have been sometimes accused of throwing out a specialty as a bait to allure other and general practice. In other words, they impose on the confidence of their brethren, and seek to rob them of their just prerogatives. But one word need be said about such conduct; it is utterly reprehensible.

Specialties have in many instances been to their practicers means of rapid professional advancement. But the specialist has no royal road to favor and position. He may have keen competitors; he may have mistaken his vocation; he has no immunity from hard and vigorous labor. If he claims much, he must know much. If he would know much he must work zealously. Above all, he must not set out leaping in a course soon to slacken his pace, to lag among the dullards, and be consigned to the shelves of the yellow and the musty. If for

any cause he cannot by honest endeavor and honorable efforts attain that success which he hoped, rather than do wrong to his fellows in practice, let him lay aside all pretences to special practice, and, if need be, enter into general practice, in another place, where none can charge him with using unworthy arts to dissemble sinister ends. A specialist who announces himself by approved means as being such, must be that and that alone. It may happen to him that an emergency, a person in sudden illness, a victim of an accident, a case of poisoning, may demand his immediate attention, because no other help is near or could be timely. Humanity forbids him to refuse doing all that he can to give relief. If he be qualified to come to the rescue of the sufferer, he has reason to glory that no narrow views of what a specialist should know and be able to do, have prevented him from acting the part of benevolence in a critical moment. This crisis past, the specialist resigns the case. It may sometimes even be proper for him to continue his attendance, because of family relationship or of other extraordinary reasons. These cases are, however, entirely exceptional, and do not weigh in the general argument.

There need be no difficulties between specialists and general practitioners, any more than among gentlemen in social relations. I doubt not the time will come when no one will dream of any necessary antagonism among any classes of medical men who hold to the principles of honor and truth, to the love of science, and to the welfare of humanity.

Already an era of good feeling has begun between specialists and general physicians. We see around us men in special practice on terms of cordiality and confidence with all their brethren—each conceding to the other his just place—neither intruding upon the other offensive assumptions. So may it always be wherever the art of healing carries its beneficent work.

AMERICAN
Ophthalmological Society.

BOSTON, *June 12th*, 1866.

The Society met at the Massachusetts Charitable Eye and Ear Infirmary, and was called to order at 10 A.M. by the President, Dr. EDWARD DELAFIELD. Present:

Dr. EDWARD L. HOLMES	Chicago, Illinois.
" JOSEPH S. HILDRETH	" "
" EDWARD LORING, JR	Baltimore, Md.
" EZRA DYER	Philadelphia, Pa.
" C. A. ROBERTSON	Albany, N. Y.
" JOHN JEFFRIES	Boston, Mass.
" HENRY W. WILLIAMS	" "
" JOHN H. DIX	" "
" G. HAY	" "
" HASKET DERBY	" "
" B. JOY JEFFRIES	" "
" FRANCIS P. SPRAGUE	" "
" W. W. SEELY	Cincinnati, Ohio.
" C. R. AGNEW	New York.
" C. M. ALLIN	" "
" HERMAN ALTHOF	" "
" F. J. BUMSTEAD	" "
" W. F. HOLCOMB	" "
" HENRY D. NOYES	" "
" D. B. ST. J. ROOSA	" "
" HENRY B. SANDS	" "

Minutes of final meeting of Session of 1865 were read and approved.

The President made a brief opening address.

The following committees were appointed:

On Nomination of Officers—Drs. Agnew and B. J. Jeffries.

On Election of New Members—Drs. G. Hay, Sands, Dyer, Seely and Holmes.

On Subject for Discussion at next Meeting—Drs. Dyer, Hay and Holmes.

On behalf of the Publishing Committee, Dr. Bumstead made a verbal report.

Treasurer's report read and referred to an auditing committee.

Dr. B. J. Jeffries read the report of the Committee on Ophthalmic Bibliography. It was referred to the Publishing Committee, with power.

The committee to audit the Treasurer's account reported it correct and properly vouched for, and it was then ordered on file.

The Corresponding Secretary, Dr. Althof, reported that he had been in communication with the Secretary of the Société Générale d'Ophthalmologie, respecting representation of the American Ophthalmological Society in that body, but had not yet obtained an official answer.

Written communications being in order, Dr. Sands, of New York, read the following paper:

Sudden Monocular Amaurosis, presenting Unusual Difficulties in Diagnosis. By Dr. Henry B. Sands, New York.

It is now fifteen years since the invention of the ophthalmoscope. Few persons not practically familiar with its use can realize the influence which its employment during this brief period has had in modifying previously existing views regarding the pathology and treatment of the diseases of the eye. By enabling the surgeon to examine the crystalline lens and vitreous with a degree of minuteness hitherto unattainable, and by rendering distinctly visible the parts constituting the fundus oculi, which had previously been concealed from direct observation during life, it naturally led to the adoption of an entirely new system of classification of the more deeply seated ocular diseases—one in which vague conjecture was replaced

by scientific precision. By the joint labors of a multitude of earnest investigators, a great variety of morbid appearances were soon detected and described, and their true nature made evident in the light of pathological anatomy. In the description and diagnosis of disease, refinements so nice as to excite a feeling of ridicule in the minds of the uninitiated found their justification in facts capable of easy and convincing proof. The gain to science was immense, and few persons at the present day will be found willing to dispute it.

As has happened before, however, in the case of the stethoscope, the microscope, and other valuable inventions, the new instrument failed to afford all the information that was demanded of it, and we are yet compelled to retain the unsatisfactory and unmeaning term "amaurosis" in the nosology of ophthalmic medicine. This is not owing to any defect in the instrument itself, but simply to the fact that its application is restricted to the interior of the eyeball; consequently important lesions affecting the sense of sight may exist in the optic nerve, or in the brain, which the ophthalmoscope is unable to reveal. Yet even here the more deeply seated disease generally leads to ultimate changes in the optic papilla and the retina, the observation of which, by the aid of the ophthalmoscope, is often sufficient, if taken in connection with the history of the case, to establish a correct diagnosis.

These remarks may appear trite, but they seem naturally to precede the narration of a case in which the evidence afforded by the ophthalmoscope, although valuable, proved insufficient to explain all the symptoms presented by the patient under observation.

On the 13th of November, 1865, I was consulted by a medical friend, who told me that, while dressing himself a few hours previously, he had suddenly felt his left eye "dazzled" by the light of the sun. Presently he noticed that the sight of that eye was obscured, but supposing that the dimness would soon pass off, he immediately bathed his eyes in tepid water. Within fifteen minutes, however, from the time he first discovered the imperfection of his sight, vision of the left eye was entirely abolished. No pain attended the attack. He was certain that both eyes had been normal until that morning.

as during the two or three days immediately preceding he had used the affected eye in looking through the microscope. The patient was twenty-seven years of age, and, with the exception of an attack of hæmoptysis, which had occurred eight years previously, he had enjoyed uninterrupted good health. He had never suffered from rheumatism.

On examination I found as follows: *Right eye*, normal in external appearance; vision perfect. *Left eye*, pupil considerably dilated when both eyes are exposed to the light, and greatly so when the right eye is closed; feeble contraction takes place only when light is admitted into the sound eye. Perception of light almost entirely absent, although patient can just discern the concentrated light thrown into the eye by means of the ophthalmoscope; tension normal.

Ophthalmoscopic Examination, 12, M., five hours after the attack. *Right eye*, normal. *Left eye*, media transparent; branches of central artery very small, being scarcely traceable beyond the papilla; veins hardly, if at all, diminished in size; at centre of macula lutea a circular disk, of a deep red color, sharply outlined, having about one-third the diameter of the optic papilla; the latter very pale and anæmic, contrasting strongly with that of the healthy eye; between the optic papilla and the macula lutea another deep red spot, resembling the first, but of nearly double the size, and having an irregularly oval shape, the long diameter situated in the horizontal median plane. The appearances thus described were also seen by my friends, Drs. Noyes and Althof. Careful auscultation of the chest failed to discover the least sign of cardiac disease, the presence of which, indeed, there was no good reason to suspect. The patient was directed to remain quiet, in a dark room, and to have six leeches applied to the left temple.

At 7 P.M. I saw him again, in consultation with Prof. Schweigger, of Berlin. Meanwhile, and, according to the patient's statement, before the application of the leeches, a decided improvement in vision had taken place, and he was able to count figures at 2′ in several parts of the visual field. The latter, however, showed various interruptions, and central vision was absent. *Ophthalmoscopic examination:* Arterial vessels of the retina restored to their natural size; veins

slightly turgid; retina gray and cloudy, especially around the macula lutea, where the red spot formerly mentioned still exists. The larger red spot near the nerve also remains the same. Patient ordered to have the eyes bandaged.

Nov. 15. Hardly any change. The visual field exhibits, beside other interruptions, a large central scotoma, about 7′ in diameter, at 1′ from the eye. Latterly, patient counts fingers at 3′, except when held above and to the right side. Ophthalmoscopic appearances nearly the same. The whole retina, however, is more decidedly cloudy, and conceals the choroid from view. The cloudiness is most marked in the neighborhood of the macula lutea, toward which numerous fine vessels are seen to converge. The two red spots still quite distinct.

Nov. 17. No change. Ordered potass. iodid. gr. v., ter in die.

Nov. 21. Vision a little improved, the central scotoma being smaller. The ophthalmoscope shows a nearly transparent retina, and also, for the first time, a swollen, reddish, infiltrated and dirty looking optic nerve, the contour of which is hazy and ill defined. Removed bandage from the eyes, and substituted smoke glasses.

Nov. 24. Still slight improvement in vision. Central scotoma a little smaller, extending principally to the right side of the centre of the visual field. *Ophthalmoscopic examination:* Retina nearly transparent; red spots less distinct; optic papilla still red and indistinct. Allowed patient to walk out, wearing the glasses. Iodide of potassium to be continued.

Dec. 5. Signs of neuritis disappearing, the nerve looking abnormally white, with irregularly notched margin. It is needless to give further dates of examination, except such as relate to the projection of the visual field. The accompanying figures represent the form and relative size of the central obscuration, which, it will be observed, diminished up to December 26; subsequently it again grew larger, and now has nearly its original form and dimensions. Its longest diameter, when measured upon a blackboard held at the distance of twelve inches from the eye, is seven inches.

Within the dark spot vision is wholly absent; eccentric

vision, however, does not seem to be materially impaired. An ophthalmoscopic examination made a few days ago revealed the ordinary signs of atrophy of the optic nerve, which had a

Limit of central obscuration, Dec 5 1865. Limit of central obscuration, Dec. 18, 1865

whitish, fibrous, glistening appearance, but was slightly, if at all, depressed. Both the arteries and veins were greatly reduced in size, the former being scarcely perceptible. Nothing special was seen at the macula lutea.

The case above detailed is the only one of the kind that has come under my observation, and possesses a singular interest, I think, from the obscurity which attended the diagnosis. I have preferred giving at first a simple statement of facts, reserving until now the reflections which they suggest.

Limit of central obscuration, Dec. 26, 1865. Limit of central obscuration, May 1, 1866.

In the first place, there can be no doubt that the loss of sight

was sudden, as the patient not only remembered to have used the affected eye a day or two previously in microscopical examinations, but had also observed, within the space of a quarter of an hour, the change from mere dimness of vision to total blindness. In the next place, it may be fairly assumed that, when one eye is sightless and the other perfect, the lesion must be situated either in the eyeball itself or at some point between the latter and the commissure of the optic nerves. Any lesion involving the commissure, the optic tracts, or the tubercula quadrigemina, would, for anatomical reasons, necessarily affect both eyes at the same time. A similar statement may be made in regard to sudden blindness coming on after sexual excesses, long fasting, exhausting diarrhœa, sudden and copious hemorrhage, etc.; in all these instances both eyes are simultaneously involved. Among the causes of sudden blindness situated within the eyeball itself, if we exclude cases of injury to the cornea, iris, and crystalline lens, the most frequent are detachment of the retina and hemorrhage into the vitreous, either from the vessels of the ciliary processes, or of the choroid and retina. Here, too, the diagnosis is easy, and the difficulties are at once cleared up by the ophthalmoscope. Finally, we meet with instances in which the refractive media are entirely transparent, and in which the retina shows no structural alteration sufficient to account for the total and almost instantaneous loss of sight. To this category belongs the case now under discussion.

In 1856, Virchow[1] gave the results of a post mortem examination of two women, who had died of puerperal fever, in each of whom he discovered evidences of acute disease of the interior of the eyeball, depending upon the presence of emboli in the arterial vessels; and he then predicted that many cases of amaurosis, occurring in connection with valvular disease of the heart, would find their true explanation in this occurrence. It was not long before his prediction was verified, for in 1859 von Graefe detailed, with great minuteness, the particulars of a case in which the diagnosis of embolus of the central artery

[1] Gessammelte Abhandlungen, pp. 539, 711.

of the retina seemed fully established. Subsequent post mortem examination proved the accuracy of this opinion, and some among us have been fortunate enough to see the beautiful specimen prepared by Dr. Schweigger, in which the embolus can be distinctly seen, completely occluding the central artery of the retina, just behind the plane of the lamina cribrosa. Since the date of von Graefe's publication, at least ten[1] additional cases have been recorded in foreign journals, in which the diagnosis of embolus was pretty clearly made out. The symptoms of the disease are tolerably uniform. Sudden blindness, with subjective luminous sensations, announce the invasion of the disorder. At this period, on ophthalmoscopic examination, the media are found to be transparent, the optic papilla pale, and both the arteries and veins of the retina reduced to an extreme degree of tenuity. After the lapse of some days or weeks, the vessels may partially regain their previous size, especially towards the periphery, probably from the development of a collateral circulation. The retina exhibits an opalescent opacity, especially near and at the macula lutea, the centre of which, however, is usually marked by a deep red spot, which, by some observers, is looked upon as an extravasation of blood, while by others it is ascribed to the natural color of the choroid, seen through the retinal substance (which, in this situation, is exceedingly thin), and contrasting with the grayish opacity of the surrounding infiltrated retinal tissue. The final result is usually atrophy of the optic nerve and retina, with nearly total loss of sight; and when vision is partially restored, it is generally limited to the eccentric parts of the visual field.

Now, in the case I have recited, although many of the symp-

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[1] Blessig. Archiv. für Ophthalmologie, Bd. 8, Ab. 1, S. 216.
Schneller. Ibid., S. 271.
Liebreich. Deutscher Klinik., No. 50, 1861.
Pagenstecher. Mitheilungen aus der Augenheilanstalt zu Wiesbaden, No. 2, p. 275.
Just. Klinische Monsblätter, Juni, 1863.
Saemisch. Ibid., Janv., 1866.
Hirschmann. Ibid.
Quaglino. Ophthalmic Review, April, 1866.
Quaglino. Ibid.
Fano. Annales d'Oculistique, t. lii., p. 239.

toms above mentioned were present, I think we must reject the diagnosis of embolus for the following reasons: 1st. The absence of any evidence of cardiac disease. This alone, however, would not be decisive, provided all the other symptoms were present. 2d, and principally, because the phenomena of the retinal circulation, as revealed by the ophthalmoscope, cannot be reconciled with the theory of complete and permanent arterial obstruction, such as would be caused by an embolus. In every reported example of this affection, it has been noticed that both the arteries and the veins of the retina were greatly reduced in size. This is what we should expect, *à priori*, seeing that an embolus, while it would prevent the blood from entering the central artery and its branches, would in no way interfere with the return of the blood through the veins, which would, consequently, also be empty. But in the present case, the *arterial branches alone* were anæmic, while the veins were filled with blood. Furthermore, if the two red spots above described are to be regarded as extravasations, it may be inferred that the hemorrhages were the result of increased pressure on the walls of the veins, due to their congestion. That the red spot at the macula was hemorrhagic in character is, to my mind, evident, not only from its appearance, but also from the fact that throughout the whole course of the disease the total absence of central vision pointed strongly to the existence of a lesion at the yellow spot. The other and larger red spot had also exactly the appearance of an extravasation, and its situation was such that it could hardly be regarded as the effect of contrast. Finally, it is to be observed that the symptoms of arterial obstruction were of but few hours' duration. The arteries which, at noon of the day of attack, were almost invisible, at 7 o'clock in the evening of the same day were seen by Dr. Schweigger and myself to be of their normal size. This fact would be difficult to explain upon the supposition of embolism.

The theory which appears to me to explain most satisfactorily the morbid phenomena in question, is that which assumes the primary lesion to have been an extravasation of blood into the sheath of the optic nerve, between the globe and the optic commissure. Such a lesion has not, so far as I am

aware, been demonstrated by dissection, but several instances have been recorded in which the symptoms rendered its existence highly probable.[1] Hemorrhages in the substance of the retina and at the base of the brain are by no means rare, and it is quite possible that the same lesion may occur in that commissure which we call the optic nerve. My own solution of the present case would be as follows: at first, hemorrhage within the sheath of the optic nerve, compressing suddenly the nerve fibres, the central artery and vein. Hence, the empty state of the arteries, the fullness of the veins, and the general œdematous infiltration of the retina. Hence, also, total blindness, due partly to insufficient arterial supply, and partly to a diminution in the conducting power of the optic nerve fibres. Next, hemorrhages into the retina, owing to mechanical congestion of its veins. Later in the day, diffusion of extravasated blood, in consequence of which, the pressure being lessened, the arteries again filled with blood and the retina again resumed its function, except centrally, where vision remained absent in consequence of hemorrhage at the macula lutea. Lastly, inflammation of the optic nerve, with its usual termination in atrophy. During the progress of the neuritis, I thought that the red discoloration of the optic papilla might be owing to the presence of extravasated blood, which had found its way along the sheath to the surface; but I was not certain that I saw any thing more than the simple redness of hyperæmia.

I have spoken of hemorrhage *within* the sheath of the optic nerve, because, if blood had been effused external to the sheath in sufficient quantity to have caused the symptoms mentioned, it would necessarily, at the same time, have exerted pressure upon the other nervous filaments traversing the orbit, and would have given rise to pain, strabismus, and other morbid phenomena, which were not present.

After the conclusion of Dr. Sands' paper, Dr. Allin gave a verbal account of a case somewhat resembling the above. This he afterwards reduced to writing, and permission having been given for its publication it is presented, as follows:

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[1] Hutchinson. Ophthalmic Hosp. Reports, vol. iv., p. 237. Pagenstecher. Op. cit., H. 1, p. 54.

Case of Sudden Monocular Amaurosis. By Dr. Charles M. Allin, of New York.

The case which Dr. Sands has reported resembles so closely, in many of its features, that of a patient who came under my observation during the last summer, that I think it will be interesting to consider the two together. The result, in my case, was almost complete restoration of sight at the end of about six months.

Miss J., aged fourteen years, of a peculiarly nervous temperament, applied to me for relief on the 5th of July, 1865, stating that three weeks previous, while at school in the country, she suddenly felt a slight itching sensation in her left eye, and upon rubbing it a little found that she could not see with it. The lids also of that eye were spasmodically closed. There was no pain, no giddiness, no disturbance of any other function. She had, as I learned, been much excited the evening previous, had cried much, and slept but little during the night, and had had some headache early in the morning.

A physician of the place gave her some "eye drops," which she had continued to use, but without relief. No ophthalmoscopic examination had been made, so that I am unable to report, as Dr. Sands has done, what were the immediate changes in the appearance of the fundus.

When I saw her, vision was still entirely absent. When the lids were forcibly separated there was no power of fixation, the globe moving spasmodically in every direction, the strongest tendency being to turn inwards. The pupil was rather *contracted*, and seemed to be slightly active under the influence of strong light. She could move the eye in any direction requested, but was unable to retain it in any one position.

With the ophthalmoscope I found the optic papilla of an almost perfectly blank whiteness, the arteries almost imperceptible, and the veins certainly not enlarged, but rather diminished, if at all changed. I could perceive no special change at the macula lutea, but the whole fundus was more pale than in the other eye. I suspected that she might be deceived, and that she might have always been blind in that eye and had just perceived it; but she was confident that such was not the case.

I ordered her to take the iodide of potassium in large doses, and she continued it with commendable regularity until the 27th of August, when she was able to separate the lids by muscular effort, and could recognize the shadow of my hand in moderately strong light. The ophthalmoscopic appearances at this time were but slightly changed from those observed at the first examination.

On the 28th of September she had recovered control of the muscles of the globe, and was able to count my fingers at a distance of six feet, and could distinguish the letters in 100 of Snellen at two feet. I made no examination of the field of vision. The optic disk now presented a pinkish appearance, though of not nearly so deep a shade as in the right eye, and the retinal vessels, both arteries and veins, were larger than at the time of the examination in July.

Soon after this visit she went into the country, and I have no record of the case until the 10th of January last, when vision seemed to be almost completely restored. She could read No. 3 of Snellen at eight inches, with ease, and could distinguish the letters in XXX at twenty feet. The interior of the eye now presented nearly its normal appearance. The arteries were not quite as large as in the right eye, and the optic papilla was somewhat paler.

In this case I think there can scarcely be a doubt that the loss of vision was attributable to a hemorrhage producing pressure sufficient to interfere with the function of the optic nerve; but while, in Dr. Sands' patient, it is quite probable that the hemorrhage occurred *within* the sheath of the nerve, in the case under my care it must have taken place further back and outside the sheath, involving in its pressure, though to a more limited extent, some of the branches of the third and fifth nerves. The effect upon these latter was apparently that of irritation rather than of paralysis.

Dr. Dyer read notes of an examination of the eyes of a person hanged by public execution for murder. The paper was entitled—

Fracture of the Lens of one Eye and of the Anterior Capsules of both Eyes, from Death by Violent Hanging. By Ezra Dyer, M.D., Philadelphia.

As this is a case of remarkable interest, and, to my knowledge, the first on record, I shall report it in considerable detail. After death by hanging there are some lesions which we might look for in the eye, such as suffusion of blood under the conjunctiva, dislocation of the lens, effusion of blood into the vitreous, detachment of the retina, and perhaps rupture of the sclerotica. In this case none of these were found, but a decided *fracture* of the lens.

Anton Probst was born in Baden, is 24 years old, 5 feet 9 inches high, weighs 174½ lbs., is a firm, stout, healthy looking man, stands straight, has a rather sluggish expression of countenance, but not a bad one, eats and sleeps well. He is under sentence of death for the most brutal and deliberate murder of a whole family of eight persons, the youngest being only two years old. He beat their brains out with an axe, having enticed them one by one into the barn. When one was killed he covered the body with hay, and brought out another, the baby being the last.

At the time of the sentence he only weighed 162½ lbs., while on the day of execution, about six weeks after, his weight was 174½ lbs., a gain of 12 lbs.

Through the kindness of Drs. John B. Bidelle and H. Y. Smith, I was afforded every opportunity to make my examinations satisfactory and complete.

Two days before the execution I had the cell darkened, and with a common light examined both eyes carefully with the ophthalmoscope. The eyes are rather prominent, pupils a little larger than normal, and not very active to light—in fact, decidedly more sluggish than usual; media clear, fundus normal, except that the scleral ring was a little more marked than usual—the same amount, however, often exists in healthy eyes. I proved his accommodation to be good. I examined his eyes again, but not with the ophthalmoscope, one hour before his execution. They were still slightly prominent, pupils large and clear, and a slight injection of the vessels of the conjunctiva was noticed.

Execution. He was executed June 8th, 1866, at 11 A.M. The scaffold was made with a drop floor, the rope was five-eighths of an inch in diameter, five feet six inches long, and the fall was three feet.

The knot was adjusted under the left ear; death was very speedy and quiet. For two minutes, at intervals, there was a slight motion of the abdomen, as if in attempted respiration, and at the same time the knees were drawn up a little. He hung for thirty minutes, and was then instantly removed to the dissecting room, which occupied about four minutes. Prof. S. H. Dickson and Dr. W. H. Pancoast kindly assisted me, and corroborated my observations.

Post mortem examination, thirty-five minutes after the drop fell. Body and head moist and warm; there had been an emission of semen; face was livid, and the upper lid discolored; abrasion of the skin under the right ear, and a deep red mark all around the neck.

The eyeballs were not more prominent than before death; lids were closed and not discolored; there was scarcely any tension in the eyeballs; corneæ a little dull; pupils a little more dilated than before, and moist from mucus.

The body was placed upright in a chair and supported, as the head had a tendency to fall. The eyes were first examined with the same oil lamp that had been used at the examination before death. Nothing could be obtained but a deep tan color from the whole of the fundus.

Not being able to make out any of the vessels with the light from the oil lamp, it was removed to give way to a powerful electric light, which Dr. B. H. Rand kindly furnished me, from a battery of thirty-six cells. I ought to mention that, previous to the examination of the criminal, I had examined Dr. Pancoast's eyes, and he mine, with this light, so that the post mortem examination should have a real value. The fundus, as seen by this light, is magnificent, but I must not speak of it here.

The examination of the eyes of Probst with the electric light gave the following results: Right eye—there was a line running transversely across the lens, and about a line below the centre. From it, at various angles, ran short and long fine

lines, very near together, but not regular. This line had an iridescent or opalescent appearance, and as it was illuminated a gentleman standing behind remarked that it looked like a crack in a cake of clear ice. At first I thought it a film of mucus on the cornea, but soon saw that it was in the lens. It was a fracture involving the anterior capsule, and extending in a horizontal plane backwards into the substance of the lens. It gave even to those present, unaccustomed to the ophthalmoscope, the idea of a plane extending backwards.

On rotating the ball downwards, the fracture could be seen to stop about the centre of the lens, and to end in several lines projecting backwards, longer than the rest. The little fissures running upwards and downwards from the main transverse fissure were of different lengths; more than half of those on the lower side ran down to the margin of the pupil, almost all those on the upper side extending above the horizontal diameter of the lens, and the longer ones perhaps a line further.

The whole lens had a most beautiful iridescent appearance, which was greatest in the line of the main fissure. This was determined by strong convex glasses. Nothing of the fundus could be seen, not even a trace of a vessel.

The left eye presented the same transverse line, a line and a half below the centre of the lens. It was evidently the same thing as in the right, only less in extent. The line had very short lines running upwards and downwards, which were very close together. They could only be seen with a strong glass, and gave the line a feathery look. I judged that here the crack was confined to the capsule. The line was perfectly evident to a person standing three feet behind the examiner. The fundus could not be seen. Neither pupil contracted under the light. The body was then laid on the table, and the battery used to contract the various muscles of the body. The flexors of the arms and legs responded, and I tried, from curiosity, to stimulate the contractile films of the iris, but without success.

The eyes were then removed, and four hours afterwards carefully examined. Dr. S. W. Mitchell assisted me. The condition of the right lens was precisely as described above. Lens in place; fracture transversely from *edge* to *edge* of the

capsule, one line below and parallel to the horizontal diameter of the lens. From this crack a fissure extended backwards into the substance of the lens, as far as the middle suspensory ligament, which was not ruptured. Retina not detached; eye normal, except as above mentioned; left eye showed a line difficult to distinguish, but made out with certainty, corresponding in position to that of the right eye. It was undoubtedly a fracture of the anterior capsule. The weight of the fall coming principally on the right side (the knot being under the left ear) probably explains the difference in the condition of the two eyes.

Dr. Pancoast made a very thorough post mortem examination, which revealed nothing of interest, so far as the eyes were concerned, except the remarkably small size of the brain, which weighed only 2 lbs. 4 oz. instead of the average 3 lbs. 2 oz. There was no congestion or effusion in the ventricles. The spinal cord was intact, and the heart entirely empty.

I was so much interested in the subject that I procured three very large dogs, and hanged them in the following manner:

After the rope was adjusted, each dog was held as high as a man could reach, and then dropped. The man followed the body down with his hands, and as soon as it was brought up by the rope the man pushed it down with all his force, adding at least twenty pounds to the force of the fall. The drop was three feet.

Drs. S. W. Mitchell and W. W. Kern assisted me; dog No. 1, weighing 35 lbs., was hanged with a drop of three feet; the rope broke. He was tried again with the rope doubled, but it broke again. His eyes were now examined to see if the two shocks had occasioned any change in the eyes; they evidently had not interfered with his bodily health in the least. A slight line, looking exactly like those in the eyes of Probst, about a line in length, was observed in the left eye, starting from the external border of the pupil towards the centre. He was now hanged the third time, a new cord being used, which held. Death was very quick and easy; the first two attempts did not seem to trouble him at all. The last fall was at 7 o'clock 6 min.; at 7.9 examined by gas light; media were clear, and a most strange appearance of the fundus was ob-

served. It seemed to move like a panorama, first from right to left, and then suddenly changed, and moved from below upwards.

The movement was quite rapid and steady, and lasted for more than a minute. I wondered if he saw the beautiful changes of scene and color which people experience when hanged, as so often described. At 7.10 the line was longer and more distinct, being evident to the naked eye; at 7.15 a large clockwork magnesium lamp was used, and the rupture seemed twice or three times as deep.

It is evidently in the posterior half of the lens, but runs horizontally from the posterior capsule towards the centre of the lens. Radiating lines are seen, and cross lines pervade the lens.

7.25, same appearance, only more marked. Nothing to be seen in the right eye. At 7.30 he was hung up in another place to make room for dog No. 2, weight 30 lbs.; drop, as before, three feet. When first examined the media were found clear. After half an hour's observation nothing abnormal was observed. He died hard, and struggled from eight to ten minutes.

Dog No. 3, weight 30 lbs.; dropped three feet. Hard struggles, but not so hard or protracted as No. 2. Eyes examined previous to the hanging, and found normal. After hanging fifteen minutes, a faint line was seen across the right lens; thirty minutes after, very marked and distinct. At this time, an hour and a half after dog No. 1 was last examined, another examination was made. An Argand gas light was used. Dog No. 1: left eye—fissure across the lens very marked and distinct; can be seen by a person standing behind the one using the ophthalmoscope. The radiating and other striæ of the lens are well defined, and the lens is cataractous. From the radiation of the lines it is evident the lens is not displaced. Right eye, which at first showed nothing, now has a transverse line similar in direction and position to that in the left eye, and very closely resembling that in the left eye of Probst. The knot in this case was on the right side at the last hanging. Dog No. 2 shows no change at all in either eye. Dog No. 3 has distinct but not deep transverse fracture of the lens of the right eye; left shows nothing. There was no dislocation of the lens in any of the eyes.

I consider that these experiments are very satisfactory. They were made with every precaution and great care, and the results are certainly interesting. I will not attempt to explain the matter, but in a few words give the *résumé:*

One man and three dogs were violently hanged. The man and two of the dogs, *i. e.*, three out of four subjects, showed this peculiar lesion. The man and dog No. 1 died without struggle. In both the fracture extended through half the lens of one side and across the capsule of the other. Knot on the opposite side of the greatest lesion in both cases. Dog No. 3 died with convulsions, which lasted a short time. Lesion found in one eye well marked, the other eye normal.

Dog No. 2 died with prolonged convulsions; no lesion could be observed. We do not find this result in death from natural causes. Is it connected with the sudden concussion and shock to the nervous system? The whole subject is so new to me that I content myself at present with a mere statement of facts, proposing still further to extend my experiments.

Dr. Allin moved that when the Society adjourn it be to meet at the City Hospital at 9 A.M. to-morrow. Carried.

On motion, ordered that the Committee on Ophthalmic Bibliography be made permanent.

Dr. Agnew, as a member of that Committee, offered his resignation. Accepted. Dr. Loring, of Baltimore, appointed in his place.

The Committee consists of Drs. B. J. Jeffries, Althof, and Loring.

The Publishing Committee of previous year were re-appointed, consisting of Drs. Bumstead, Derby, and Noyes.

On motion, resolved that the assessment for the coming year be $10.

Dr. Hildreth moved the appointment of a committee to take into consideration the subject of fees. Lost.

Dr. Agnew offered a resolution that the proceedings of the Society shall not be furnished to the non-medical press for publication. Carried.

The Committee on Election of New Members reported the following persons to be balloted for as active members:

Dr. Francis Delafield, New York;
Dr. Charles E. Rider, Rochester, N. Y.;
Dr. John Green, St. Louis, Mo.;
Dr. A. F. Wadsworth, Boston, Mass.;
Dr. Bolling A. Pope, Memphis, Tenn.;
Dr. H. L. Shaw, Boston, Mass.; and the following as honorary members:
Dr. C. Schweigger, Berlin, Prussia.
The above-named persons were all duly elected.
At 2 P.M., on motion, adjourned.

BOSTON, *June* 13, 1866.

The Society met at 9½ A.M. at the City Hospital. In the absence of the President, Dr. Holmes, of Chicago, took the chair.

Minutes of previous day's meeting read and approved.

Dr. Noyes made a statement respecting printed schedules for recording cataract operations.

On motion of Dr. Hildreth, the subject of statistical tables was referred to the Publishing Committee.

Dr. Hildreth, of Chicago, read a paper entitled:

EXTRACT FROM OBSERVATIONS UPON ANÆSTHESIA OF THE CORNEA AND RADIATING FIBRES OF THE IRIS OCCURRING WITHOUT INTRA-OCULAR TENSION. By JOS. G. HILDRETH, M.D., of Chicago, Ill.

By anæsthesia of the cornea I here refer to that diminution of its sensitiveness to touch which may exist without apparent organic disturbance of the part.

By anæsthesia of the radiating fibres of the iris, to a condition of this membrane which, without mechanical complication or apparent organic change, prevents the pupil from properly responding to the influence of atropia or light.

The degree of anæsthesia may be ascertained by gently touching the cornea obliquely with the point of a small, soft camel's hair pencil, previously wet and stripped quite dry; or

the point of a small twisted roll of unsized paper slightly moistened.

This should not be repeated more than once or twice during a minute, lest a degree of toleration be established which would interfere with correct appreciation.

The iris is to be tested by using a given number of drops of atropia in solution of definite strength.[1] But its dilatability does not always correspond to the state of the cornea, being in some cases greater with the same degree of anæsthesia than in others; yet, the amount of atropia and time required for dilatation are valuable diagnostic guides. The influence of light should also be noted.

These pathological conditions may exist from a slight to a very marked degree, and doubtless are caused by a certain abnormal state of the ciliary apparatus, which may result from intra-orbital, cranial, or spinal causes; and possibly, in some cases, be idiopathic. It can also be temporary, as it were, spasmodic, or become permanent.

The influence exerted by this affection upon other diseases, especially panniform and ulcerated keratitis, infiltration and sloughing of the cornea in purulent ophthalmia, pannus, and some forms of atrophy of the globe, engages particular attention.

When slight, of recent origin, or spasmodic, it may, in some cases, be relieved by medical means only; but, if existing to a high degree, or of long standing, division of the ciliary ring becomes necessary.

The following clinical facts are taken from the records of the United States Eye and Ear Hospital. All were operated upon without ether or chloroform.

Furrow, æt. 29. April 13, 1865. Left eye. Cornea considerably anæsthetized, panniform, and centrally ulcerated; pupil only slightly influenced by atropia. No apparent change of iris, *no tension of globe;* acute pain in and about the orbit.

Division of ciliary ring.[2]

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[1] Four grains to the ounce.

[2] The point of operating was in all of these cases between the external and inferior recti, unless repeated, when it was between the inferior and internal.

The corneal anæsthesia was at once relieved, and the pupil became dilated in thirty minutes, though no atropia had been used for more than twenty-four hours. Pain speedily abated.

June 19. From the date of the operation there had been no return of pain; the pupil readily responded to atropia, but was not fully susceptible to light. The reflex movements were more marked from than to this side. No corneal anæsthesia remained; its panniform condition had greatly improved, and ulceration healed. Periphery of retina apparently unimpaired.

General and local medical treatment previous to the operation had failed to afford relief.

Crippen, æt. 20. April 13, 1865. Right eye. Cornea panniform, ulcerated, and considerably anæsthetized. Pupil slightly influenced by atropia. No other affection of iris; *no tension of globe;* severe pain in and about the orbit.

Ciliary ring divided as in preceding case.

Corneal anæsthesia immediately disappeared, and the pupil dilated in ten minutes, though no atropia had been used for twenty-four hours. Pain in orbit at once relieved, and from surrounding parts in a few days.

June 19. The corneal anæsthesia had not returned; the pupil dilated easily, and responded to light. Ulceration had healed, and panniform condition was improving. No return of pain. Periphery of retina unaffected, and reflex movements of irides equal.

Medical treatment had failed to afford relief.

Lamont, æt. 49. April 26, 1865. Left eye. Pain of varying intensity, radiating to corresponding supra-orbital and coronal regions. Cornea anæsthetized, and iris only feebly influenced by atropia. *No tension of globe.*

General and local medical treatment, with frequent paracentesis of the anterior chamber, had failed to materially improve these conditions.

The ciliary muscle was divided obliquely backward from its corneal attachment, about four and a half or five millimetres.

Corneal anæsthesia was at once largely diminished, and the pupil dilated in about twenty minutes. Pain in the orbit relieved within a few minutes, and in coronal and supra-orbital

regions in forty-eight hours. No atropia had been used within twenty-four hours of the operation.

In course of ten days, the pupil, having been allowed to contract again, was found beyond the influence of atropia. The corneal anæsthesia was increasing and pain returning.

May 13. The ciliary muscle was again divided from its anterior insertion obliquely backward about six and a half or seven millimetres.

The immediate effect was, as before, to remove the corneal anæsthesia, and to allow the pupil to dilate in about twenty minutes, from the effects of atropia that had been used forty-eight hours previously, as none had been employed since that time.

October 16. The corneal anæsthesia had not returned, the pupil was perfectly free, and responded to the action of atropia and light. Its contraction by reflex action was not so perfect as that of the opposite side.

Ulceration of the cornea had healed.

Peripheric vision, with dilated pupil, was good.

The imperfect results following the first operation are attributed to imperfect division of the affected parts of the ciliary ring. But it is probable all of its effects would not have been lost, as they were, had the use of atropia properly been kept up.

Hughes, æt. 23. Right cornea anæsthetized, and the pupil slightly affected by atropia.

Medical treatment, with repeated and systematic paracentesis of the anterior chamber, slightly influenced these conditions.

May 11. The pupil contracted; was not affected by atropia, and the cornea was still anæsthetized. No other apparent affection of the iris, and *no tension of the globe.*

Division of the ciliary ring, with the immediate effect of removing the corneal anæsthesia, and causing the pupil speedily to dilate, though no atropia had been used for twenty-four hours.

June 19. The pupil has been dilatable since the operation, and anæsthesia of the cornea has not returned.

Peripheric vision of this eye apparently good, and reflex movements of irides are equal.

Pemberton, æt. 29. March 18. The cornea of the right eye anæsthetized, and the pupil feebly influenced by atropia; considerable pain in and about the orbit. No intra-ocular tension.

The ciliary ring was divided, which immediately removed the anæsthesia of the cornea and caused the pupil to speedily dilate.

No atropia had been used for twenty-four hours.

June 17. The corneal anæsthesia has not returned; the pupil dilates readily and responds to light. Periphery of retina unaffected, and reflex movements of irides equal.

The above cases represent the pathological conditions under observation, and show the results of division of the ciliary ring upon them after general and local medical treatment, aided in a number of them by frequent and systematic paracentesis of the cornea, had failed.

In no instance did evacuation of the aqueous humor affect the anæsthetized condition of the cornea or allow the pupil to dilate, though atropia was at the time freely used.

The influence of these conditions upon some forms of keratic disease is also above made apparent.

In the following case partial atrophy of the globe and corneal anæsthesia were both relieved by division of the ciliary ring after iridectomy had failed.

Hamilton, æt. 20. Left eye. Large leucoma, with anterior synechia; remainder of cornea nebulous and anæsthetized. Slight atrophy of the globe. Iridectomy, September 15, 1865.

October 11. Anæsthesia of cornea remains, and atrophy of globe unchanged.

Division of the ciliary muscle caused the corneal anæsthesia to disappear within forty-eight hours.

November 6. Globe is firm, and cornea normally sensitive.

The form of corneal insensibility under observation is usually uncomplicated; but it may co-exist with intra-ocular tension, as in the following instance:

Johnson, æt. 25. Left eye. Staphyloma of choroid; iris dark and disorganized; pupil contracted and bound by posterior synechia; cornea anæsthetized; intra-ocular tension well marked.

October 30. Iridectomy followed in fifteen minutes by division of the ciliary muscle.

After the removal of one-sixth of the iris from its pupillary to the ciliary margin, the cornea remained an æsthetized as before, but was immediately relieved by the second operation.

In two other cases the pupil, quite undilatable, yielded upon administering ether to a high grade of relaxation.

Dilatation became quite full in one, was easily maintained by atropia, and permanent relief followed. Only partial in the other; on discontinuing the drug, the pupil contracted and refused to dilate as before.

Several times I have observed this condition of the iris to be carried by reflex action to the opposite side. So that, upon relieving the eye most affected, it gradually disappeared from the other.

In some instances a certain grade of anæsthesia has been modified by well dilating the pupil, which accounts for the favorable influence of this remedy in keratic affections.

Von Graefe remarked, in 1859, that if the pupil readily dilates by atropia, there would be less liability to suppuration after extraction of cataract, or words to that effect.

That condition producing the corneal anæsthesia, specially described in this paper, undoubtedly often has been instrumental in producing unfavorable results in this operation, and it should be removed before flap extraction.

The early diagnosis of that condition represented by corneal anæsthesia and iritic insusceptibility to atropia, is of the greatest importance in purulent ophthalmia, as it is frequently followed by infiltration and consequent sloughing of the cornea or ulceration from the epithelial surface without previous infiltration.

If the narrow and dense band of conjunctiva immediately surrounding the cornea remains intact, infiltration of the subepithelial structures will precede sloughing; but if this conjunctival band early become infiltrated or disorganized, sloughing

from the surface soon follows, though the parts beneath may not be infiltrated.

I would operate in all such cases when anæsthesia of the cornea could not be relieved by atropia, and especially when the pupil had become undilatable, and then *maintain the effects of the operation by the use of atropia.*

As stated in a previous paper, this operation should not wholly be relied upon in such cases. Other means must also be used to control inflammatory action, the purulent discharge, and the chemosis. But by its proper and timely use, the cornea can be saved when all other known means *combined* would inevitably fail.

The successful treatment of pannus by syndectomy and purulent inoculation involves one of the causes of its original production—imperfect nutrition of the deep tissues of the cornea.

From results already recorded, and experiments in progress, it is evident pannus may yet be successfully treated without resort to purulent inoculation.

As this paper is intended only to report certain clinical facts, theoretical deductions, as far as practicable, have been omitted.

Dr. G. Hay, of Boston, read a paper entitled:

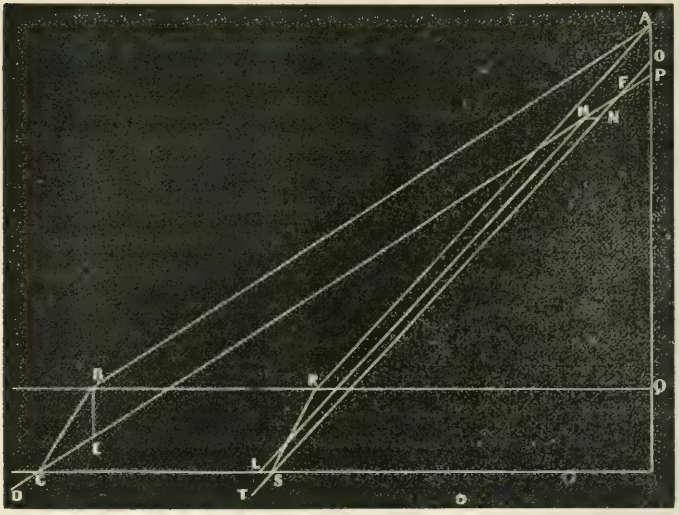
REFRACTION OF A SMALL, OBLIQUE PENCIL OF DIVERGING RAYS BY A GLASS PLATE WITH PLANE PARALLEL SURFACES. By G. HAY, M.D.

In measuring with the ophthalmometer of Helmholtz, use is made of the lateral deviation of the image of a small object by means of a glass plate held more or less obliquely to the direction of the object. The image, however, is not only displaced laterally, but, according to Fick, in the "Med. Physik," p. 292, is brought a little nearer to the observer. This latter displacement, though not requiring to be measured in using the instrument, is of some optical interest, as may be seen by considering the following problem:

To find the virtual focus of a small, oblique pencil of diverging rays refracted by a glass plate with plane parallel surfaces.

Solution. Consider first the rays in the section of the pencil

made by a plane passing through its axis and perpendicular to the plate, the lines in the figure lying in such plane.



Let the broken line A B C D represent a ray proceeding obliquely from the point A, the origin of the pencil, to the plate B C Q, and refracted by it. Continue D C, which is parallel to A B, to P, its intersection with A Q, the perpendicular from A to the plate. On the continuation of D C, mark off C M equal to B A. The focus F of the rays in the section of the pencil above referred to will be between M and P.

Proof. Let A R S T represent another ray in plane A B Q, making a small angle with A B, and refracted by the plate. Take C L, equal to B R. C S must be greater than C L. L M must be parallel to R A. T S, parallel to A R, will, if continued, meet the line D C P at a point F farther from C than M is. Draw M N parallel to L S.

Call the angles of incidence of A R and of A B respectively and a', and let

$$a' - a = \Delta a = \text{angle B A R.}$$

Similarly, let the angles of refraction be β and β', and let

$$\beta' - \beta = \Delta\beta;$$

triangle M N F gives

$$M F : M N = \cos a : \Delta a;$$

$$M F = M N . \frac{\cos a}{\Delta a} \quad . \quad . \quad . \quad . \quad . \quad . \quad [1]$$

To find M N (= L S).

A ray parallel to A B and meeting the plate at R would be refracted parallel to B C, and would pass through L. Then angle L R S = $\Delta \beta$. (The line L R is not drawn in the figure.) From the relation between angles of incidence and refraction, $\sin a = n \sin \beta$; we obtain, approximatively, Δa being small,

$$\Delta \beta = \Delta a . \frac{\cos a}{n \cos \beta}.$$

From triangle L R S we have

$$L S : L R = \Delta \beta : \cos \beta;$$

$$L S = \Delta \beta . \frac{L R}{\cos \beta} = \Delta a . \frac{\cos a}{n \cos \beta} . \frac{L R}{\cos \beta} = M N;$$

and by [1],

$$M F = \frac{L R}{n} . \frac{\cos^2 a}{\cos^2 \beta}.$$

Triangle M A P, equal to triangle B C E, B E being perpendicular to B R (line M A is not drawn in the figure), gives

$$M P : M A \ (= L R) = \sin \beta' : \sin a' = \frac{1}{n};$$

$$M P = \frac{L R}{n}.$$

Therefore, M F < M P, since $\frac{\cos^2 a}{\cos^2 \beta} < 1$, a being greater than β, lies between M and P.

If we suppose a' very small, M A becomes nearly equal to the thickness of the plate; M A, M P, and A P have nearly the same direction. Then M F = M P = $\frac{2}{3}$ the thickness of the plate, consistent with the usual result that for a small direct pencil the image approaches the plate by one-third the thickness of the plate.

Thus far only the rays of the pencil, situated in a plane passing through its axis and perpendicular to the plate, have been considered. The other rays may be divided into sets, each set lying in a plane passing through the line A Q, and making a

small angle with the plane A B Q. The focus of each such set will have a situation in its respective plane similar to that of F in the plane A B Q. It is also to be noticed that if the rays of any set are continued back in their respective plane beyond their focus, they must pass through the line A Q in the neighborhood of the part O P. So that for the whole pencil there are two foci, each linear in extent: one in the line A Q, near the portion O P; the other passing through the point F, and at F perpendicular to the plane A B Q. This is consistent with a remark on page 238 of the "Physiologische Optik" of Helmholtz, as follows: "Speaking generally, homocentric rays, after they have been refracted by a prism, are no longer homocentric, but every infinitely small pencil of rays has two foci, as is the case with homocentric rays refracted by ellipsoidal surfaces, or, when incident obliquely, by spherical surfaces."

As to the question whether this want of homocentricity in the refracted rays should not cause indistinctness in the image seen through the plate, it might be shown that the length of each of the two lines in which the rays unite is smaller in proportion as the size of the pencil and the thickness of the plate are smaller.

Dr. H. Derby, of Boston, read a paper

On the Necessity of Employing Greater Accuracy in Ascertaining and Expressing the Degree of Acuteness of Vision. By H. Derby, M.D., Boston.

This is a subject of absorbing importance. It is the text in which ophthalmology records its triumphs. That it should be clear, defined, terse, and accurate, none will deny, as upon its possession of these qualities depends the value of our scientific observations.

The older ophthalmologists gave the results of their treatment, operative or medicinal, in a vague and unsatisfactory manner. We are informed that the vision in one case remained imperfect; in another, became so much improved that the patient could read ordinary type, or even fine print. One could see objects about him nearly as well as ever; another received imperfect impressions. This information is very well as far as

it goes, giving, as it does, an approximate idea of the benefits resulting from the operation or treatment. But in view of the vast advances recently made in the single department of operative ophthalmic surgery, it will be readily admitted that far greater accuracy of expression is required in order to decide on the relative merits of rival operations, to ascertain exactly how far the degree of vision, retained or acquired, falls short of, or how it compares with, the normal standard. The subject to be discussed during the present session is an instance in point. Of what value would be the statistics of a hundred cases of extraction of cataract where it was simply stated that the patient afterwards read newspaper print or great primer type, no allusion being made to the rapidity or confidence with which this was accomplished, to the distance at which the paper or book was held, or to the perception of distant objects? I have, for example, at present a patient laboring under an amblyopia brought about by the inordinate use of tobacco. With one eye he reads Jaeger No. 6 (brevier); with the other Jaeger No. 4 (nonpareil). This sounds like a fair amount of sight. And yet this very patient, put to the tests now in common use, is discovered to have lost, in one eye $\frac{1}{1}\frac{1}{2}$ths, in the other $\frac{1}{1}\frac{3}{4}$ths of his vision. And the principle long received, that a large retinal image aids the eye to overcome numerous circles of dispersion, enables us to account for the size of type made out when held in close proximity.

It is, therefore, no longer sufficient to say that the eye makes out a certain size of ordinary type, and it is for such reasons that the useful system of Jaeger (so great an advance on what had preceded it) has yielded to that which we owe to the genius of Snellen. With his formula we are all familiar. "The utmost distance at which the types are recognized, divided by the distance at which they appear at an angle of five minutes, gives the acuteness of vision." $v = \frac{d}{D}$ certainly deserves to come next in order to the formula of Donders for expressing the range of accommodation, the stepping-stone to his labors in that field.

I think, however, that no one can long watch the progress of his own cases and record results on the plan of Snellen, without being sensible of certain deficiencies in its present

application. And I am desirous of very briefly calling your attention to a leading source of inaccuracy, viz., *the varying degree of illumination.*

That the amount of vision is dependent on the intensity of light has been recognized by Snellen, and in his edition of 1866 he states that the illumination of the letters should be of constant value during our experiments. The majority of us have doubtless been struck with the varying answers obtained from the same person when examined at different times of day and in different states of the weather. Fractions of different value are obtained in the same case within so brief a space of time as to preclude the possibility of any appreciable change in the vision having taken place. I do not think it necessary to dwell on this fact, entertaining no doubt that the experience of all who use the test of Snellen by ordinary daylight will bear me out in this respect.

On the principle, then, that "the illumination of the letters should be of constant value during our experiments," I would suggest an expedient which must have often occurred to every one present, and which is now brought forward with the conviction that its general adoption is a matter of considerable consequence. *Let the letters used as a test be placed in a room from which daylight is excluded, and let them be illuminated by a steady flame, uniform in intensity of illuminating power, and placed always at the same distance from the letters.*

I have followed out this plan during the past four years with great advantage, and find that its adoption not only insures accuracy in the examination, but gives confidence to the patient. Nothing is more common than to find that patients who have been already examined elsewhere, and who bring with them the results of that examination, endeavor to account for any apparent variation on the plea of the light being different or the time of day not being the same. Those, however, who come month after month and year after year, and whose vision is tested on the same or similar letters, hanging in the same darkened room, and illuminated constantly by the same light, are easily convinced that any change that may have occurred is in the eye and not the surroundings.

Each practitioner can readily decide by experiment what de-

gree of illumination will render the letters of the text visible in the proper distance to the average emmetropic eye. And the general adoption of this principle is strongly urged, with the conviction that in this way alone can we obtain results at once reliable and uniform.

Dr. C. R. Agnew, of New York, gave an account of a method which he employs in operating for diverging strabismus.

A Method of Operating for Divergent Squint. By C. R. Agnew, M.D.

The method is as follows. The patient having been placed upon his back, and under the full influence of an anæsthetic, and the eye to be operated upon exposed by the wire speculum, an assistant draws the cornea as much as possible towards the outer canthus by catching the tissues over the tendon of the external rectus muscle in the blades of a pair of fixation forceps. The operator then makes a horizontal opening over the internal rectus muscle, midway between its borders, and extending from a point one line distant from the cornea down to the semi-lunar fold. This opening should be made by lifting a vertical fold of the conjunctiva and sub-conjunctival tissues with forceps, and cutting these with scissors in a horizontal direction. If care is exercised, the internal rectus muscle will be exposed without any difficulty or the occurrence of much bleeding. The next step is to secure the entire tendon of the muscle which is to be brought forward. This is especially essential in those cases in which the divergent squint has been the result of the operation for convergent squint; for in such cases the tendon and theca, having been much haggled in the original tenotomy, fall back irregularly, and, being split more or less, form false insertions, which are zigzag or interrupted.

After the apparent insertion of the muscle has been brought into view, a strabismus hook, having an eye drilled in its free extremity, and armed with a waxed silk, is made to sweep beneath it, from below upwards, care being taken to keep the instrument in close contact with the sclerotic, and carried so

far back as to include every straggling band of muscle or theca which is to be advanced.

The uplifted mass should then be tied close to its sclerotic implantation. The next step is to divide the external rectus muscle freely through a horizontal wound in the conjunctiva, and thus complete the preliminary steps for the advancement of the internal rectus. The latter step is effected as follows. The operator, holding the ligature firmly in one hand, should cut with scissors the insertion of the muscle and gently break up any bands of connective tissue which may attach it to the sclerotic. As he does this, he should draw upon the ligature and sway it from side to side until it becomes evident that any adhesions which might obstruct the advancement of the muscle have been overcome. He should now estimate the amount of adduction which may be necessary to cure the divergence. This he can do by catching with forceps the sclerotic edge of the cut tendon of the external rectus and drawing the cornea towards the inner canthus, while he holds up upon the stretch the muscle to be advanced. The retentive sutures are now to be placed. For this purpose two delicate, short and sharply curved needles are to be armed with fine, well waxed silk and adapted to a needle-holder.[1]

Having measured the extent to which the eyeball must be adducted in order to correct the divergence, the sutures should be passed through the muscle and its theca as far from its cut end as may be necessary. The muscle should be drawn well out and kept upon the stretch, so that the sutures may be passed through it as deeply as possible behind the caruncle, to secure a firm hold, and to leave a somewhat longer mass between the perforations made by the sutures and the ligature upon its cut end than the original divergence measured. The course of the sutures should be perpendicular to the plane of the muscle, one passing through near its upper margin, and the other near its lower. After the sutures have been placed in the muscle the end included in the ligature should be cut off, care being taken to leave enough to prevent their tearing out. The amount cut

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[1] The needle-holder of Dr. H. B. Sands, New York, is decidedly the best for this purpose.

should nearly equal the degree of divergence to be corrected, allowance being made for shrinkage which has followed the detachment of the muscle from the sclerotic. The next step is to carry the sutures beneath the conjunctiva above and below the cornea. It is better to place the upper suture first. This also requires the curved needle. The point aimed at in carrying the needle along the sclerotic, beneath the conjunctiva, should be about a line above the cornea and over the centre of the line of implantation of the superior rectus muscle, and there the suture should emerge. Before tying the upper the lower suture should be brought out at a corresponding point over the inferior rectus insertion. While the operator is cautiously tying the sutures his assistant should, catching hold of the insertion of the external rectus, carry the cornea towards the internal canthus as much as possible, and thus effect what may be considered the real intention of the operation, namely, to adduct the eye strongly, and thus place the end of the *shortened* internal rectus in co-aptation with the sclerotic at the natural line of sclerotic implantation. The exercise of a little care will cause the muscle to spread out and be hidden behind the horizontal pillars of the wound through which the retentive sutures have been carried; and thus insuring a consolidation of the wounded parts, obtain the aid of the subsequent cicatricial contraction of the soft parts intervening between the cornea and the caruncle in the ultimate result. Whether this method be adopted throughout or not, I am quite sure that the use of the strabismus hook, armed with a ligature, will be found of great advantage in getting control over the tendon to be advanced, and making the surgeon feel sure that he has secured the entire mass. I have employed the method upon two eyes which had been rendered divergent by operations for convergent squint performed by a wandering quack. In one of these eyes the divergence was more than five lines, in the other about four. In the first eye I induced a small amount of convergent squint, which was cured by applying the glass, which neutralized existing hypermetropia. In the second case I produced a very slight degree of convergence, not exceeding a line, which was also removed by the use of the proper glasses. And in both these

cases the existence of hypermetropia would have rendered glasses necessary, aside from any convergence.

I have also satisfactorily performed the operation in two cases in which slight paresis of the internal rectus, the result of injury, had led to divergent squint.

In one case, in which the divergence was so great that one-fourth of the cornea was buried beneath the external canthus, the result was only partially successful; but I propose to repeat the operation after the cicatrix over the region of the internal rectus has so matured and softened as to render a repetition of the steps possible.

I have not seen any inflammation of an annoying character following the procedure, and my experience thus far justifies me in employing the method in preference to any other, as I believe that the risk to the eye is very much less than by any other, and the probability of success greater. I believe that the chance of success is greatly increased by dividing the external rectus of the fellow-eye, even though you propose to advance the internal rectus of one eye only.

Dr. Williams, of Boston, introduced a patient who possessed an extraordinary control over his ocular muscles. He could move his eyes with most surprising rapidity up and down and from side to side to side, the movement being sudden and jerky. He had learned to do this as a matter of amusement. He also had luxation of the crystalline lens.

Dr. Noyes, of New York, read a description of a case of Amblyopia produced by Osmic Acid:

AMBLYOPIA PRODUCED BY OSMIC ACID. By HENRY D. NOYES, M.D., New York.

In the *Edinburgh Medical Journal* for February, 1866, is an account of the recent progress of chemistry, by Dr. Stevenson M'Adam, and a statement is made of the poisonous effects of a new substance, mercuric methide, and that among the mischiefs to the nervous system, viz., deafness, idiocy, numbness, it caused loss of sight.

I am induced to relate the following observation of poison-

ous qualities belonging to another rare chemical agent, viz., osmic acid. This substance is a derivative from the metal osmium, and the latter is found associated with platinum and iridium in minute quantities. It is stated in Brande & Taylor, p. 490, that "when heated in the air osmium burns into an oxide and exhales poisonous fumes, having a peculiar odor, somewhat like that of chlorine."

In June, 1863, Dr. P., assistant in a chemical laboratory, came into my office, stating that he had been suddenly made blind in the left eye in the following manner. He was heating in a crucible a compound of iridium and osmium. He took out a bit of the metal with a pair of forceps for closer inspection, and, though aware of the poisonous properties of the fumes, incautiously held it near the left eye. Immediately struck with a sharp pain, he shut the eye and drew back. In ten minutes he came into my office. The lids were spasmodically closed, light very distressing, and pain in the globe severe. The conjunctiva and sclera were intensely injected, and lachrymation profuse. Pupil of natural size and activity. Sight dim, viz., $\frac{1}{3}$, and reads only No. 3 of Jaeger at ten inches. All objects look dim. This dimness is not the effect of lachrymation, because wiping away the tears does not better the vision. Accommodation perfect. There are no muscæ nor phosphenes; the visual field normal. By the ophthalmoscope, both the inverted and upright image, no material change discovered. The media clear, the optic nerve pink, but not unlike the other eye.

The external inflammatory symptoms continued for one day, and then the eye resumed its normal condition, both in appearance and function.

Dr. P. informed me that a similar accident had once before occurred to him, and that he had seen an account of such an occurrence to a Russian chemist.

The impaired sight was not the effect of the irritation of the conjunctiva, because an equal degree may be excited by the presence of a foreign particle without any amblyopia. Dr. P. and myself were both convinced that a peculiar poisonous influence was exerted on the retina, produced in a marvelously short time, by the simple contact for only an instant of the irritating fumes of osmic acid with the surface of the globe.

Dr. Noyes also read an account of Cases of Sub-Retinal effusion:

Cases of Sub-Retinal Effusion—Puncture.

Case I.—1865, February. Mr. B. F. N., æt. 35, native of Orange County, New York, a policeman, weighs about 230 lbs., of florid face and very muscular. For two months has had flashes of light, bursting balls of fire. Sight had always been good; had no pain in eyes, but some heaviness of the head; bowels regular. A few days ago sight of left eye suddenly injured; cannot read any print; visual field in its upper half is entirely dark, the line of division being nearly horizontal (the lower half is normal). By the ophthalmoscope the retina is seen to be pushed into the vitreous humor by subjacent hemorrhage. The sac occupies the lower and outer portion of the fundus. The vitreous clear, the optic easily seen, and the emergent vessels congested.

Right eye, vision 1; at the edge of the optic disk is a little crescentic atrophy of the choroid, as in posterior staphyloma, but there is no myopia.

I determined to puncture the retina in hope of improving sight. At evening, with the aid of Dr. Agnew, who held the upper lid, I performed the operation. The patient, placed under a gas-light, and the eye illuminated by a mirror attached by an elastic band to my forehead, a broad, double-edged needle was entered between the superior and external recti muscles, and advanced until its point was distinctly seen in the vitreous humor; it then was plunged into the highest part of the retinal sac, and the point carried backwards to enlarge the perforation. Blood at once flowed into the vitreous. Applied a compress and bandage.

The following day took eight ounces of blood from the median frontal vein, with great relief to the oppression in the head. Ordered a brisk cathartic.

On the second day examined interior of eye, and found the vitreous filled with clots. By a strong light could see the retina floating at a lower level and much wrinkled; it was before quite smooth and tense. After two weeks the moderate reaction which took place passed away. During five months

there was a gradual clearing up of the vitreous humor, but never to a degree which gave useful sight. Then, viz., in July, serous irido-choroiditis ensued, with great injection, pain and tension. By paracentesis and moderate antiphlogistics this was overcome.

October. A chronic inflammation remained; the globe softened; the pupil irregular and adherent; iris atrophied; vitreous filled with opaque material; no perception of light; considerable ciliary congestion and neuralgia.

April, 1866. Atrophy of globe decided; eye not painful; lens cataractous.

Case II.—Mr. R. V., farmer, New Jersey, æt. 26, of temperate habits, good health, was under treatment in the summer of 1862 for sub-acute retinitis with serous effusion into the vitreous of left eye. The case continued during ten months under treatment, until the eye became clear and vision good. For a year there was no change. Muscæ then began to appear before the opposite eye, and after continuing for a month a sudden and great loss of vision took place, for which he again consulted me. I found the visual field much encroached upon at its periphery, and central vision reduced to the perception of large objects, as the hand at a short distance. By the ophthalmoscope, the lesion was found to be an effusion of serum which had stripped up the retina throughout its entire circumference. It hung in folds into the vitreous, projecting on all sides toward the axis of the globe. The vitreous turbid; by peeping under the retinal festoons the nerve could be dimly seen, and was deeply congested.

After a fortnight, during which he was cupped and purged and otherwise treated, no improvement took place, although the serum settled to the bottom of the eye and appeared to fill two-thirds of its cavity. The retina floated freely upon it, thrown into numerous folds, had a gray, opaque color, and some spots of a very dense white. Optic then invisible. Visual field existed only below the horizon and within very narrow lateral boundaries. I determined to resort to the puncture of the retina with the view of allowing the serum to mix freely with the vitreous, and hoping that the retina would resume its proper relations, if not immediately, as a result of gradual

absorption. I made use of two straight, broad needles, entering the sclera at its equator, one between the internal and inferior recti, the other between the external and inferior recti. I was aided by Dr. Bumstead, of New York, and Dr. Williams, of Brooklyn. The operation was by gas-light, and the interior of the eye illuminated by a mirror attached by an elastic band to my forehead. I could see the point of one needle emerge through the retina, and could feel the other touching it. I lacerated the retina in the same manner that we tear a capsular cataract. On withdrawing the needles, about six drops of a pale fluid escaped, and the globe was soft. Previously its tension was normal. Applied pressure bandage.

The following day the visual field had risen to a higher level; eye slightly injected. On third day, used the ophthalmoscope, and found the vitreous filled with membranous opacities.

About two months afterwards it was found that the effusion remained beneath the retina; at the bottom of the eye it was opaque, and appeared to be as great in quantity as before. There was also effusion behind the retina at its upper part. This fluid was very clear and small in quantity, permitting the retina to lie very close to the choroid. With this portion of the retina he could perceive light, but not count fingers. Optic entrance visible. After two months longer there was no change, certainly no improvement either in vision or in ophthalmoscopic appearances.

The other eye, namely, the left, which had first been the subject of treatment, continued good, vision being $\frac{20}{20}$, the optic habitually hyperæmic.

One year after, in February, 1866, the patient came to me again. Within the last three months he had had three attacks of sudden dimness of sight. The first two had lasted but a few days; from the last, which took place four weeks before, he was still suffering.

I found the vitreous humor pervaded by clots, and the optic not visible because of the turbidity; the visual field equal in all parts, and no separation of the retina. There had been no pain, and the patient knew of no cause to produce this hemorrhage.

After two months longer a fresh bleeding occurred, and at this time behind the retina, leaving him barely perception of light in the upper and outer part of the visual field.

Notwithstanding derivative treatment, pretty actively employed, and regulated diet and mode of life, no improvement was effected, and the patient remains blind.

After the non-success of the attempt to get absorption of the sub-retinal effusion in the first eye, it was not deemed of any avail to make another effort in the second.

I found it very difficult to explain the cause of the repeated intra-ocular effusions and hemorrhages. The patient was of temperate habits, lived a regular life, being a farmer, had no occasion to overtax his eyes, and possessed robust health. Had no hemorrhagic diathesis; very rarely had epistaxis; very seldom had headache. There was no heart disease, no atheroma of arteries, no irregularity of the pulse. Urine normal. The only clue to a cause is found in the fact that his mother died of apoplexy.

From the more extended and unsatisfactory experience of Bowman and Graefe in the surgical treatment of sub-retinal effusions, we are driven to attempt yet other methods of relief. It is doubtful whether any form of suction would prove more successful, but it may be worth trying.

The prognosis in this disease is always extremely unfavorable, but I have the satisfaction of adding two instances in which a very decided improvement took place by the almost complete and spontaneous absorption of the fluid.

Case III.—October 11, 1864. Mr. C. M. J., æt. 40, engraver, health good, myopic $\frac{1}{8}$; has chronic ophthalmia tarsi; has had no trouble of sight except by an accident 16 years ago, when one eye was struck by a piece of wood; its sight was destroyed for a month, but afterwards restored. Four days ago the left eye suddenly became dim; there was no pain nor external inflammation. The visual field is dark below the horizon, and on the outer side the impairment reaches a little above the horizon. By the ophthalmoscope an effusion of a light color is seen to have taken place behind the retina, at the upper and inner part of the fundus, evidently serum.

On the 15th, eight days from the attack, the visual field became much more extensive.

On the 18th, eleven days from the attack, the field of vision was complete; the sharpness of sight was such that with glasses —10 he could count fingers at eight feet. By the ophthalmoscope the vitreous is found to be hazy, but no large masses floating in it. No detachment of the retina can be discovered, nor could I find any evidence of its having been torn or perforated.

On the 20th haziness of the vitreous continues, but permits the optic to be seen. On the portion of the fundus where the effusion occurred, ripples or folds of the retina can be discerned, as if it had not yet become smoothly applied. I can also discover, when the eye is turned upwards, a mark like a scar, surrounded by white spots and pigment masses, as if there had been at some former time a laceration of the choroid. I consider it extremely probable that this is the result of the blow inflicted on the eye sixteen years ago, and which caused a temporary loss of sight. He has now metamorphopsia; upon looking at straight parallel lines, some of them have a curve like this $\frac{1}{2}|\frac{1}{4}$. No lesion can be discovered at the macula lutea.

I met the patient in the street some months afterwards, and he averred that sight had improved until it was almost as good as before the effusion took place.

In another instance of post-retinal effusion I have seen a decided diminution in the quantity of fluid. The place of detachment was on the temporal side of the fundus, and extended over but a small space. The fluid appeared to be serum.

There have been other cases recorded in which absorption of such effusions has occurred. In the *Klinische Monatsblätter*, March, 1866, page 81, are two cases: one spontaneous, recorded by Steffan, the other the effect of an orbital abscess, related by Bertin. In both these instances the effusion was serum.

It is well known that an effusion may descend to the bottom of the eye, stripping up the retina, and permitting the portion originally pushed off to relapse to its place, and sometimes to recover its function; but the cases I have cited were of a different and more auspicious character. The event of absorp-

tion is exceedingly rare, but it is a satisfaction to know that in the case of serous exudation it is not impossible.

There are two points to which I would call attention, viz., how to make the diagnosis of a very small and transparent post-retinal exudation, and the fact that then the functions of the retina may not be entirely suspended.

I have found it a little troublesome to distinguish a slight lifting up of the retina when the subjacent fluid was transparent and the retina not opalescent. Careful scrutiny will decide the diagnosis, by observing that the retina exhibits at this spot a rippled reflection, something like the effect produced by a seamed and irregular pane of window-glass. The light glances from it as it would from the surface of water rippled by a gentle breeze. This is to be seen by the inverted image, and may be pronounced upon with far greater certainty by the binocular than by the monocular ophthalmoscope. This is one of the cases which exhibits in a striking way the great advantages of the binocular instrument. Another point in diagnosis is gained by the use of the upright image, in the direct method of examination. If the eye be emmetropic, a portion of the fundus will be found where hyperopia becomes evident. While a weak concave glass, say —1-36, may be needful to get a sharp image of the fundus, at the place of detachment, this glass will be superfluous, and the transition from attached to separated retina will, at the borders of the exudation, become manifest. If any large retinal vessels traverse the detached portion of the membrane, their tortuosity will at once settle the diagnosis. But my remarks apply to the case where no such aid is afforded. In such cases I have sometimes been able to see the choroidal vessels through the retina and subjacent serum.

To verify the diagnosis beyond question, put a convex glass behind the mirror and try how strong this may be and yet give a clear view of the detached retina. Knowing, then, the refractive condition of the eye, the difference between the usual emmetropia, myopia or hyperopia of the eye and the local hyperopia, diminished myopia or greatly increased hyperopia, will prove that the retina is pushed into the vitreous humor.

Finally, I may briefly allude to the fact which others have

noticed, that even when lifted from the choroid, providing the fluid be not great in quantity nor opaque, the retina may retain perception of light and possibly perception of objects. This has a bearing upon prognosis and also upon diagnosis, as derived from examination of the field of vision.

Dr. B. Joy Jeffries, of Boston, made a communication on the

Anatomy and Physiology of the Ciliary Muscle in Man.

At the meeting of the Society in June, 1865, I made some remarks on the anatomy and physiology of the ciliary muscle in man, and as recent investigations have seemed to confirm them, I shall take the liberty of presenting these in support of my views. I said that I followed others in considering that the ciliary muscle in man, by contracting upon its origin, slackened up the suspensory ligament, and thus allowed the lens to become more convex, thereby accommodating the refractive media of the eye to the divergent rays of light from near objects, and focussing them on the retina. In placing together the anatomical accounts of this muscle, I could not make out that the muscular fibres known as Müller's circular fibres are a distinct mass, enabled to act together as a separate part of the whole muscle. In this I am now further confirmed by the investigation of Meyer, from whom I have roughly copied these drawings. From this I think it will be seen that these circular fibres can, in contracting, but assist the action of the meridional ones.

"From George Meyer's (Med. Student in Bremen) Essay on the Comparative Structure of the Annulus Ciliaris in Man and Mammals, to which a Prize was awarded by the Faculty of Heidelberg. R. Virchow's Archiv, November, 1865.

"The *annulus ciliaris* in *man* is attached by a very thick fibrous net to the posterior and inner wall of Schlemm's canal, and over a short space of the adjacent sclerotic. The fibre bundles run in various directions from Schlemm's canal, some as a meridional layer directly backwards, lying close against each other to their insertion in the choroid, and others in a curve from outwards inwards (concavity towards centre of eye). These last

bundles form numerous intercommunications, and divide up into several smaller ones to again unite further on. There are thus formed numerous open spaces which are mostly filled with Müller's circular fibres. These open spaces are more frequent over the ciliary processes, and therefore most circular fibres are here found. These circular fibres also frequently interlace; often some of the muscular bundles pass from their meridional direction into a circular one."

Prof. J. Henle's description and drawings of the ciliary muscle, lately published, agree with Meyer's. In his physiological remarks, he considers that "the action of the circular and meridional fibres mutually assist each other in increasing the thickness of the muscle." He says that accommodation takes place as I have held, "produced as far as we can now see by the ciliary muscle, but in what manner the latter acts is still *unproved*."

I also stated that the annulus ciliaris or ciliary muscle differed so much in animals from man that it was useless to attempt to adduce from them the mechanism of accommodation in man, and had on this account desisted myself. Meyer's investigations seem to bear me out in this also, as will be seen from these two rough drawings of the ciliary muscle of a wild cat, and the annulus ciliaris of an antelope. Meyer examined a number of different animals, still hardly enough to draw a complete conclusion. His results are as follows:

"The *annulus ciliaris* of the *apes* consists of very long contractile fibre-cells. Its topographical relations greatly resemble the human as regards origin, insertion and form. Open spaces are rarely present in the tissue, and Müller's fibres are entirely wanting.

"The *annulus ciliaris* of the *carnivorous animals* is muscular in character, its fibres run from before directly backward, and leave no interspaces. The circular muscular bundles and the so-called intercommunicating fibres are entirely wanting.

"The *annulus ciliaris* of the *rodents* is formed either of subscleral tissue or true connective tissue; it is at any rate very insignificant, and in some hardly perceptible.

"The *annulus ciliaris* of the *pachydermata* consists of connective tissue, the separate bundles of which lie without inter-

spaces, so close together as to render them readily mistaken for muscular fibres. The ciliary band is in them thin, but extends far backwards.

"The *annulus ciliaris* of the *solipeds*, as in the horse, consists of a fine net of connective tissue stretched transversely from sclerotic to choroid. The whole tissue is thin and insignificant; nothing is seen of a compact mass.

"The *annulus ciliaris* of the *ruminants* appears as a firm mass, of grayish white color, consisting of connective tissue. It is wedge-shaped, placed between the sclerotic and choroid, and varies considerably in its dimensions. The individual bundles lie here also close together so as to leave no interspaces."

In vol. xi., part third, of the "Archiv für Ophthalmologie," Dr. Heiberg, of Christiana, has published an article on the anatomy and physiology of the Zonula Zinnii, in which he concludes, from microscopical examination, that there are in it true muscular fibres, which, he thinks, by pulling on the capsule of the lens, flatten it, and thereby adapt it for rays from distant objects, producing what has been called negative accommodation. He gives microscopic drawings of these fibres from the zonula of the horse, and also from man, resembling the striped muscular fibre of animal life with nuclei. Were this positively so, it certainly would be a very important fact; but Prof. J. Henle, of Göttingen, has, in the last published portion of his Systematic Human Anatomy, shown that this transverse marking is very different from that of muscle of animal life, and is due to a very fine folding of the fibre caused by the action of the acetic acid, the same as is produced on fibres of connecting tissue. The zonula fibres are nearest allied to fibres of elastic tissue, yet differ from these in their reaction to acetic acid and potash. Finkbeiner thought he found striped muscular fibres in the zonula. Nuhn, as also Dr. Heiberg, found that a certain proportion of these fibres became striped from the action of the acetate of the oxide of lead and acetic acid, and thought, therefore, as others (Camper, Retzius), that they were muscular, although this could not be proved, either chemically or by electric irritation. Dr. Heiberg says, however, that he found these fibres in the horse's eye when fresh.

Suture of the Flap, after Extraction of Cataract. By Henry W. Williams, M.D.

I offer for the consideration of the Society a few suggestions respecting suture of the cornea after the removal of cataract by a flap operation, in the hope that, by the adoption of such a modification of the ordinary procedure, we may so far lessen the risks of extraction that we shall not hereafter be tempted to incur the dangers attendant on the repeated introduction of instruments within the eye, and that mutilation of the iris may be rendered unnecessary.

My method consists in placing a single point of suture at the apex of the flap of the cornea, after extraction of the lens, and whilst the patient is still under the influence of ether.

After trial of various curved and straight needles, and of needles mounted upon a handle, I give the preference to straight needles of very minute size, less than a fourth of an inch in length, and with flat cutting points, as being best adapted to penetrate the corneal tissues. The objections to needles fixed upon a handle are, that it is difficult to disengage the extremely fine thread, and that in being withdrawn they drag upwards the corneal flap.

The great advantages claimed for this plan are as follows:

It renders etherization more applicable to extraction operations, as it obviates the danger of loss of vitreous after the operation, in case emesis should occur; and the patient being thus impassive, the operator is enabled to do, with deliberation and care, whatever may be requisite in removing complications which may arise in the course of an operation, without feeling that he incurs a risk of contusing the iris or losing a portion of the vitreous during sudden involuntary movements of the eye. The edges of the wound being retained in close apposition, union by primary adhesion, the first desideratum in flap operations, is rendered much more certain. The puffy, swollen state of the margin of the flap, which renders the healing process difficult and uncertain, is thus avoided, and the eye resumes at once almost its normal condition. It nearly obviates all risk of spontaneous prolapse of the iris—the "*bête noire*," to use the words of Mr. Dixon, "of extraction operations." By affecting a speedy re-establishment of the anterior

chamber, it admits of the free use of atropia, without fear that *prolapsus iridis* may ensue, thus allowing continued dilatation of the pupil to be kept up, and lessening the risk of irritation of the iris from unremoved fragments of lens, or torn edges of capsule, or from proliferous degeneration of the intracapsular cells. It permits of early and frequent inspection of the eye, and the prompt discovery of any morbid phenomena, so that timely recourse may be had to appropriate remedies.

It much abbreviates the term of rigorous confinement of the patient, and shortens the entire period of convalescence.

A single strand of the finest silk is employed for the suture. The needle is seized with strong forceps and passed through the edges of the wound, which are held with very delicate toothed forceps. The eye being entirely passive, the requisite manœuvres may be executed with delicacy and without haste. Gentle compression, by means of lint and a flannel bandage, constitutes the after-treatment.

In most cases the suture has been left to come away of itself, and, though usually becoming detached within a few days, it has in some instances remained *in situ* for seven weeks, without giving rise to more than trivial irritation. I am satisfied, however, that its presence for a longer period than is necessary is undesirable, and serves slightly to retard the patient's recovery. My present practice is to administer ether and remove the suture within a week after the operation, if it has not sooner been eliminated. It is unsafe to attempt its removal except during anæsthesia, as a sudden movement of the globe, or the pressure of the forceps, if fixation be resorted to, might, as in one of my own cases, cause reopening of the wound.

In no instance, so far as I could judge, has the suture given rise to any serious symptoms. In twenty-four cases subjected to this treatment, there have only been two failures.

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TRANSACTIONS

OF THE

AMERICAN

Ophthalmological Society.

FOURTH AND FIFTH ANNUAL MEETINGS.

Niagara, N. Y., June, 1867.

Newport, R. I., July, 1868.

NEW YORK:
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1869.

AMERICAN

Ophthalmological Society.

The fifth annual meeting of the American Ophthalmological Society was held at the Ocean House, Newport, Rhode Island, on Tuesday, July 21st, 1868.

The Society was called to order by Dr. H. W. WILLIAMS, of Boston, Vice-President, at 11 A.M.

Members present during the session were as follows:

Dr. C. R. AGNEW.....New York.
" F. J. BUMSTEAD. ..... " "
" E. DYER.....Philadelphia.
" JOHN GREEN.....St. Louis.
" G. HAY.....Boston.
" W. H. HOLCOMB.....New York.
" B. J. JEFFRIES. ..... Boston.
" ED. G. LORING .....New York.
" HENRY D. NOYES. ..... " "
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" CHARLES E. RIDER.....Rochester.
" C. A. ROBERTSON.....Albany.
" D. B. ST. JOHN ROOSA.....New York.
" H. B. SANDS..... " "
" O. F. WADSWORTH .....Boston.
" E. WILLIAMS .....Cincinnati.
" H. W. WILLIAMS .....Boston.

The following gentlemen were elected members of the Society:

Dr. RUSSELL MURDOCH ..... Baltimore.
" CHARLES E. HACKLEY. ..... New York.

Dr. J. F. Prout.....Brooklyn.
" Orestes A. Pray..... "
" Arthur Matthewson..... .. "
" Homer C. Newton..... "
" Edward M. Curtis..... Oswego.

The following amendment to the Constitution was unanimously adopted:

"No member of this Society shall attach to his name, in any public announcement, the title of oculist, or any similar title, or shall announce in print that he gives special or exclusive attention to special practice."

The place of meeting for 1869 to be Newport, Rhode Island, July 20.

The following are the officers for 1869:

President.....Dr. Henry W. Williams. Boston.
Vice-President.....Dr. C. R. Agnew..... ..New York.
Recording Secretary ...Dr. H. D. Noyes .... " "
Corresponding Secretary.Dr. H. Althof..... ... " "

The following papers were presented to the American Ophthalmological Society at its Sessions in June, 1867, and July, 1868. The former meeting took place at Niagara Falls, New York; the latter at Newport, Rhode Island.

Report on the Progress of Ophthalmology for 1865 and 1866. By Dr. B. Joy Jeffries, of Boston.

If we may judge the past two years by their ophthalmic literature, then certainly our specialty should have made some progress, for several extensive new treatises on diseases of the eye have appeared, and fresh editions of some of the older ones. The number of smaller works, compendiums, etc., has also been sufficiently numerous. Here, however, is not perhaps the place to discuss the special merits or demerits of each. That is rather the duty of the journalist and reviewer, and the work is not slurred or neglected; so that the oculist who reads the different ophthalmic quarterlies and monthlies will find in them digests and criticisms which will enable him to select what he requires for his desk or his bookcase from the literature of his specialty.

In 1865 there appeared, in the four modern languages, 137 separate books and journal articles on our specialty, and, in 1866, 224. From this it will be seen that ophthalmology is not silent, and, notwithstanding what has been said above, the statement may be hazarded that there are at least as few poor books and articles written in this as any other specialty. Through some of the master minds in medicine, ophthalmology has asserted its position in science, which, we think, has been still more firmly fixed during the past two years. The recognition by the various medical schools and teachers that the student must now have at least some rudiments of ophthalmic knowledge to become a "safe practitioner," is certainly a step in advance not to be lightly thought of or passed by. In this country our specialty still stands, like most others, in such a position that, to learn what is known and the means of applying this knowledge, the student must still visit Europe, and in the great centres of thought and investigation pursue with patient work the training of his hand and eye, and the cultivation of his powers of analysis and deduction. We believe that the recent progress of our specialty, above all in Germany, has greatly helped the other departments of medical science, by turning the attention of the profession towards European schools, and, from the superior attainments of those who have passed some time at them, induced even the laity to consider that a physician of any standing must be familiar with German and French.

Among a good deal that has been put forward or suggested in ophthalmic medicine and surgery stand prominently three new operations for removal of the lens, proposed severally by Critchett, Pagenstecher and von Graefe. Prof. Graefe's modified linear extraction for cataract deserves to be dwelt upon here, as it bids fair to rank with iridectomy among the operations on the eye. Some of those who were long in giving in their adherence to the belief in iridectomy have been forward in their adoption of this method of operating for cataract and their testimony to its safety and value. It would seem as if this means of removing the lens required such well adapted dexterity on the part of the operator, that those only perfectly at home in ophthalmic surgery would be likely to choose it in

preference to others they are more familiar with. This will not, however, prevent the operation from being soon extensively employed, for, thanks to the masters in our specialty, they not only go forward themselves, but they carry others with them. No doubt those who have been successful with the old-fashioned flap extraction will look upon Prof. Graefe's modification much as a previous generation looked upon the former in comparison with reclination. There are points about this modified linear extraction, as also in regard to Critchett's and Pagenstecher's methods, so novel and so much in advance that we would gladly dwell upon them here; but the Society has for further discussion at this meeting the subject of cataract, and therefore your committee need not introduce into this report what the members will perhaps learn better by mutual interchange of thought, criticism and the results of experience.

As but two years have passed since your committee made their previous report, there is not, naturally, so much of special investigation to receive notice at this time. Attention, however, is called to the fact that Wecker's Etudes Ophthalmologiques is completed, which fills a gap in French ophthalmology hitherto quite apparent, and rendered more so by the steady, onward progress of German investigation and study in our specialty. This gap is further filled by Fano's "Traité Pratique des Maladies des Yeux," rendering it all the more mortifying that there does not exist in English a complete work on diseases of the eye, brought down to the present day in ophthalmoscopy and the anomalies of accommodation and refraction; and yet Mackenzie's great treatise is translated into French, and by the supplement made a thorough and classic book, thus giving the French student and practitioner at least three compendious works on ophthalmology. What book in English can, like these, be said with truthfulness to fairly represent the theory and practice of our specialty?

Helmholtz's "Handbuch der Physiologischen Optik" has been finally finished and published, with an appendix, at Leipsic, this year. This great work by the inventor of the ophthalmoscope contains, so to speak, the foundation and the superstructure of the science of ophthalmology. It is, and must long be, the standard authority to which the practitioner

and man of science must refer, for it represents nearly ten consecutive years of the labor of a man whose patient perseverance, ingenious experimentation and wonderful power of logical deduction are equaled by few physiologists or physicists. Perhaps a few words in regard to the book itself may not be out of place. It forms the ninth volume of the "Allgemeine Encyklopädie der Physik," of some 900 pages, with 213 woodcuts, and accompanied by 11 plates. The more important part is in large type, and the mathematics and other portions in finer print. It has what is so often wanting in foreign books, namely, an index of subjects and authors, and last, but not least, a copious bibliography attached to each chapter. We trust that this book of Helmholtz may, like Donder's great work, be turned into English by the New Sydenham Society, as it perhaps alone could properly edit this volume.

As the Society's committee very properly did not consider it necessary to print the report of the committee made in 1866, on ophthalmic bibliography, we have appended a list of the reviews and separate works on ophthalmology, referring to the "Ophthalmologische Bibliographie" published in Zehender's "Klinische Monatsblätter für Augenheilkunde," for the journal articles for the past two years.

Principally by means of a statistical table of Dr. Knapp, of Heidelberg, we are enabled to present to the Society a more or less complete report of forty-one ophthalmic hospitals and infirmaries in various parts of the world, thinking that it might perhaps prove interesting, and enable any of our members when traveling to know in what cities eye institutions were to be found and in whose charge, together with some general information as to the number of patients, etc. Your committee regret extremely that this table is not more complete, and would ask as a favor that any ophthalmologist, seeing deficiencies in it, will send him all data that will render it more perfect. We do not know where a similar one exists. The difficulty of obtaining the requisite figures from great distances and the proper sources must be the committee's excuse, who would at the same time thank the gentlemen who have contributed their quota.

Archiv für Ophthalmologie. Prof. F. Arlt, Prof. F. C. Donders, Prof. A. von Graefe. 11th and 12th volumes. Berlin.

Annales d'Oculistique. Dr. E. Warlomont. Bruxelles.

The Royal London Ophthalmic Hospital Reports. Drs. J. C. Wadsworth, J. W. Hulke, J. Hutchinson. London. Vols. 4 and 5.

Klinische Monatsblätter für Augenheilkunde. Prof. W. Zehender. Erlangen. 3d and 4th years.

Giornale d'Oftalmologia Italiano. Dr. Giambattista Borelli. Torino.

Ophthalmic Review. J. Z. Laurence, Thomas Windsor. London.

Transactions of the American Ophthalmological Society. New York. 2d Annual Meeting, New York, 1865. 3d Annual Meeting, Boston, 1866.

Études Ophthalmologiques. Traité Theorique et Pratique des Maladies des Yeux. L. Wecker. Paris. 2 vols. 1862–67.

Traité Pratique des Maladies des Yeux. Dr. Fano. 2 vols. Paris. 1866.

Étude Ophthalmoscopique sur les Altérations du Nerf Optique et sur les Maladies Cérébrales dont elles dépendent. X. Galezowski. Paris. 1866.

Du Diagnostic des Maladies du Système Nerveux par l'Ophthalmoscopie, par E. Bouchut, avec Atlas. Paris. 1866.

De l'Ectropion. P. E. G. Cruveilhier. Paris. 1866.

Ophthalmologie. Leçons. L. H. Thiry. Bruxelles. 1865.

Theorie de la Vision suivie d'une Lettre sur l'Aphasie, par Georges Audiffrent. Paris. 1866.

Étude Clinique sur le Cancer de l'Oeil. Dr. Coste. Paris. 1866.

Étude Clinique sur les Plaies du Globe Oculaire, par Dr. Dublanchet. Paris. 1866.

De l'Oeil, Notions Élémentaires sur le Fonction de la Vue et ses Anomalies. Dr. Giraud Teulon. Paris. 1867.

Observations Pratiques sur le Traitement des Tumeurs et Fistules Lacrymales par la Formation de la Gouttière Lacrymale à l'Aide d'un Emporte-pièce. Dr. Foltz. Lyon. 1865.

Diagnostic Differentiel des Inflammations du Tissu Irido-Choroidien, par Dr. I. N. E. Chavernac. Montpellier. 1866.

Die Lehre von den Refractions- und Accommodations-Störungen des Auges. Dr. Rudolf Schirmer. Berlin. 1866.

Krankenhäuser, besonders Augen-Kliniken. Dr. J. H. Knapp. Heidelberg. 1866.

Die Refractions- und Accommodations-Anomalien des Auges. Dr. Albrecht Nagel. Tübingen. 1866.

Klinische Vorträge über Augenheilkunde. Dr. J. von Hasner. Prag. 1865.

Die Gesetze des Räumlichen Sehens. Ein Supplement der Physiologischen Optik. Dr. H. Scheffler. Braunschweig. 1866.

Compendium der Augenheilkunde. Dr. Ign. Meyr. Wien. 1866.

Zur Anatomie und Physiologie der Retina. Max Schultze.

Die Pflege der Augen nebst einem Anhange über Augengläser. Dr. Ferd. Arlt. Prag. 1865.

Anatomische Untersuchungen über die Blutgefässe des menslichen Auges. Dr. Th. Leber. Wien. 1865

Handbuch der gesammten Augenheilkunde. Dr. Eugen Seitz and Dr. Wilhelm Zehender. 2d Edition. Erlangen. 1865.

Klinische Beobachtungen aus der Augenheilanstalt zu Wiesbaden. Dr. Pagenstecher. 3d Heft. Wiesbaden. 1866.

Iwanoff. Beitrag zur Pathologischen Anatomie des Hornhaut und Linsenepithels.

Populare Vorlesungen über Diaetetik der Augen. W. Manz. Freiburg. 1866.

Zur Casuistik der Tumoren des Bulbus. R. Nauwerck. Zurich. 1866.

Experimentalstudien über die Pathologie des Flugelfelles. Dr. Alex. Winther. Erlangen. 1866.

Die Anomalien der Refraction und Accommodation des Auges. Deutsche Originalausgabe von Dr. Otto Becker. Wien. 1866.

Einleitung in der Dioptrik des Auges. A. Wullner. Leipzig. 1866.

Handbuch der Physiologischen Optik. H. Helmholz. Leipzig. 1867.

Trattato Teorico-Pratico delle Malattie della Refrazione Oculare Statica e Dinamica. Firenze, par Carlo Reymond.

Army Medical Officers' Ophthalmic Manual. By Deputy Inspector-General P. Longmore. London.

Handy Book of Ophthalmic Surgery for the Use of Practitioners, by J. Z. Laurence and Robert C. Moon. London, and also Philadelphia. 1866.

Lectures on Diseases of the Eye. Part 1st, referring principally to those Affections requiring the aid of the Ophthalmoscope for their Diagnosis. By Prof. N. C. Macnamara. Calcutta and London. 1866.

Tension of the Eyeball in Glaucoma. I. Vose Solomon. London. 1865.

Guide to the Practical Study of Diseases of the Eye. I. Dixon. London and Philadelphia. 1866.

The Optical Defects of the Eye and their Consequences, Asthenopia and Strabismus. J. Z. Laurence. London. 1865.

Recent Advances in Ophthalmic Science. H. W. Williams. Boston. 1866.

A Treatise on the Principles and Practice of Ophthalmic Medicine and Surgery. T. Wharton Jones. London. 1865. 3d Edition.

Injuries of the Eye, Orbit and Eyelids, their immediate and remote Effect. George Lawson, F. R. C. S. London. 1867.

De la Perceptivité de l'Oeil pour les Couleurs Specialement de l'Achromatopsie ou Cécité des Couleurs. Dr. E. Goubert. Paris. 1867.

Des Tumeurs des Paupières. H. Thomas. Paris. 1866.

Des Affections Oculaires Réflexes et de l'Ophthalmie Sympathique. Par Rondeau. Paris. 1866.

Des Milieux Refringents de l'Oeil, Anatomie et Physiologie. Par J. F. B. Polaillen. Paris. 1866.

Des Indications de l'Iridectomie et de sa Valeur en Therapeutique. A. Sichel (fils.) Paris. 1866.

STATISTICS

OF

FORTY-ONE OPHTHALMIC HOSPITALS AND INFIRMARIES.

City.	Number of Inhabitants.	Founded in the Year	Surgeons in Charge.	Number of Beds.	Annual No. of Patients.		Number of Days of Attendance.	Average number of days' attendance of each Patient.	Important Operations.			
					Whole Number.	House Patients.			Cataract.	Artificial Pupil.	Strabismus	Various other Operations.
Berlin	600,000	1853	Prof. A. von Gräfe	120	6,800	1649	.....	.....	325	630	580	240
Birmingham	296,000	1823	Drs. Chessire, Solomon and Townsend	...	7,353	619	.....	.....	125	65	240	270
Boston	193,000	1864	Dr. Williams	20	1,369	106	13,676	10	59	21	51	75
Boston	193,000	1827	Drs. Hooper, Hay, Derby, Sprague, Shaw and Jeffreys	36	2,785	281	.....	.....	41	62	46	86
Chicago	110,000	1858	Drs. Holmes and Powell	...	516	...	.....	.....	...	...	...	...
Dantzic	82,000	....	Dr. Schneller	19	1,801	162	3,049	19	40	102	38	16
Darmstadt	30,000	1835	Dr. Kuchler	15	.....	...	.....	.....	10	6	29	37
Dorpat	14,000	1866	Prof. Oettingen	24	.....	...	.....	.....	...	...	...	...
Dresden	128,000	....	Dr. Heymann	50	2,000	264	.....	.....	41	19	15	...
Düsseldorf	55,000	1862	Dr. Mooren	80	4,117	734	24,702	33	143	336	252	26
Frankfort	80,000	1845	Drs. Passavant, Ohlenschlager, A. Spiess and M. Schmidt	12	787	74	1,869	25	19	....	..	14
Frankfort	80,000	....	Dr. Steffan	...	1,762	...	.....	.....	14	46	31	24
Freiburg	19,000	1864	Prof. Manz	17	.....	90	1,450	16	24	28	6	....
Glasgow	490,000	1824	Drs. Mackenzie, Brown, Rainy and Reid	24	1,962	116	.....	.....	50	6	26	50
Halle	46,000	1859	Prof. Alfred Gräfe	50	2,685	546	.....	.....	101	250	140	133
Hanover	75,000	1861	Dr. Vogelsang	27	2,420	220	5,410	24	21	49	37	16
Heidelberg	17,700	1861	Prof. Knapp	64	3,561	580	8,187	14	91	142	134	128
Heidelberg	17,700	1862	Dr. Röder	42	1,181	341	8,484	25	52	149	64	79
Königsburg	95,000	...	Prof. Jacobsen	44	2,418	377	10,840	29	60	156	59	84
Lausanne	21,000	1843	Dr. Rearden	22	.....	222	7,319	33	44	12	1	14
Leipsic	80,000	1820	Prof. Ruete	31	1,787	235	6,232	27	34	22	17	62

London	3,000,000	....	Drs. Bowman, Critchett, Dixon, Wadsworth, Streathfield and Hulke	...	15,951	848	.....	.....	244	286	222	190
Ludwigsburg	12,000	1859	Dr. F. Hörnig, Jr.	23	1,324	186	5,188	23	55	55	15	56
Manchester	358,000	1814	Drs. Hunt, Windsor, McKean and S. Samelson	...	4,035	215	6,758	30	116	137	68	94
Moscow	350,000	1826	Prof. Braun	96	7,924	851	29,086	34	182	218	41	146
Munich	165,000	1823	Prof. Rothmund	40	2,037	310	....	.....	108	65	31	5
Naples	417,000	....	Dr. Quadri	...	1,656	....	.....	.....	25	18	4	38
New York	800,000	1820	Du Bois, Bumstead, Noyes, Sands, Althof, Allin, Carmalt and Delafield	40	6,957	313	.. .	.....	....	....	....	...
New York	800,000	1852	Garrish, Stephenson, Holcomb, Macfarlan, Ceccarini and Carnochan	....	1,030	...	.....	....	...	....	....	...
Prague	160,000	1790	Prof. Hasner von Artha and Dr. Kaulich	180	3,725	1048	.....	.....	153	100	13	102
Philadelphia	.....	....		35	3,500	....	.....	.....	....	....	....	....
Riga	65,000	1864	Dr. Waldhauer	75	1,889	326	13,343	41	31	70	15	113
Stettin	65,000	1864	Dr. Schleich	19	162	....	3,662	.....	25	31	6	5
Stuttgart	61,000	1861	Dr. Berlin	20	2,017	177	4,510	25	33	45	22	56
Turin	179,000	....	Drs. Sperino, Reymond and Manfredi	300	2,193	972	35,919	37	75	162	7	134
Utrecht	57,000	1858	Prof. Donders and Dr. Snellen	44	1,472	388	10,507	27	116	124	58	81
Vienna	554,000	1811	Prof. Arlt	60	3,034	391	.....	.....	170	106	10	27
Vienna	554,000	....	Prof. Stellwag von Carion	32	1,200	225	.....	.....	...	....	....	....
Wiesbaden	27,000	1856	Dr. Pagenstecher	54	2,734	427	.....	.....	99	144	91	190
Würzburg	38,000	1856	Prof. Welz	30	1,000	200	.....	.....	....	....	....	.
Zürich	40,000	1857	Prof. Horner	45	3,000	414	.....	. ....	....	....	...	....

REPORT ON THE PROGRESS OF OPHTHALMOLOGY FOR 1867. By Dr. G. HAY, of Boston.

Though the progress of ophthalmology is in part dependent on that of general medicine, the consideration of the latter would lead to inquiries too extensive for the present occasion. In the particular department of ophthalmic medicine there has been much activity. The wide fields of research and practice recently opened have been eagerly entered by numerous and able laborers, and, as in other matters, new discoveries have given rise to new inquiries. The significance and relations of the intraocular phenomena revealed by the ophthalmoscope, the extent and limits of the uses of the operation of iridectomy, the various processes occurring in monocular and binocular vision, still present matters for inquiry. Then, too, diseases such as those of the conjunctiva, lids, lachrymal passages, orbit, etc., the study of which has been only indirectly promoted by the principal modern changes in our art, have not been neglected. Moreover, attention has been given to the connection between morbid states in the eye and those in other parts of the body, in which relation especially is seen the connection between ophthalmic and general medicine. Opinions upon sympathetic ophthalmia are assuming a more definite form. The microscopic anatomy and pathology of the eye have been extensively studied.

Before proceeding to mention some of the more important additions of the last year to our special department, we have to notice the loss of the eminent ophthalmologist, Ruete, who died at Leipsic, since the last meeting of this Society. Gentlemen may remember that Ruete contributed to our knowledge of the physiology of the ocular muscles, and that in a pamphlet published in 1852 he proposed a new method of ophthalmoscopic examination, substantially that now most widely used—that of the inverted image through a perforated mirror. The two editions of his text-book of ophthalmology, published in 1845 and 1854, and his Illustrations of Diseases of the Eye, in 1854–60, are monuments of industry and professional learning. An interesting account of his life and a list of his literary productions are given by Zehender,[1] who speaks of him as "a

[1] Klin. Monatsbl., July and Aug., 1867.

man to whom truth and science counted for more than all worldly distinction; a man who, by the directness of his efforts and the importance of his results, has secured for himself an honorable and permanent place in our special science."

In examining the progress of our art we may take into consideration the contributions relative to it in the journals, monographs, reports, etc., the text-books purporting to give its present state, the results actually obtained in practice, and the education of practitioners.

The contributions bearing on the subject in the various journals, etc., are very numerous. A few of the more important may be referred to here.

Vessels.—Among the recent anatomical contributions may be mentioned Dr. Leber's "Researches into the Course and Connection of the Blood-vessels in the Human Eye." This was published a few years ago in German;[1] a rather extended abstract of it in English has been given, during the last year, in the Ophthalmic Hospital Reports.[2] These researches must be considered as a valuable contribution to the subject. One matter mentioned, though not new, is worth repeating here on account of its bearing on intraocular pathology. "It follows that a very intimate connection exists at the nerve entrance between the ciliary system and the vessels of the nerve itself and of the retina, and that the ciliary vessels are subservient to the nutrition of the disk and of its surrounding parts. The connection is, however, almost entirely arterial, and only in very small part venous." "From the choroid alone a few venous twigs pass directly into the nerve."

Another matter of interest concerns what Leber calls the anterior conjunctival arteries,[3] which, being branches of the anterior ciliary, supply the conjunctiva just around the cornea in a zone from 3 to 4 millimetres wide and anastomose with the peripheral conjunctival arteries. The connection of these anterior conjunctival arteries with those supplying in part the iris and ciliary processes should be remembered in treating granular conjunctivitis (trachoma), in old cases of which the presence of iritis is occasionally noticed.

[1] Archiv f. O., xi., 1.
[2] Vol. vi., Part 1.
[3] Ophthalmic Hosp. Rep., Vol. vi., Part 1, p. 72.

Perchloride of Palladium in Microscopic Investigations.—An account of the use of a solution of this substance in microscopic examinations, and of some results obtained by means of it in examining the minute structure of the ciliary muscle (tensor chorisidiæ), is given in the New York Medical Journal for April, 1868, also in Zehender's Monatsblätter for November and December, 1867, derived from the Archiv für Mikroscopische Anatomie, Bd. iii., p. 477, bis 499.

Prominence of the Eye-ball.—Dr. Cohn,[1] of Breslau, has devised an instrument to measure the degree of prominence of the eye. He finds that in the great majority of cases in health, supposing the head erect and the eyes looking directly forward horizontally, the apex of the cornea is situated somewhere between the level (measuring antero-posteriorly) of the portion of the supraorbital margin just above it and a position five millimetres behind this.

Circulation in the Eye.—In the number of the Ophthalmic Hospital Reports referred to above (Vol. vi., Part 1) is also an abstract of Memorsky's[2] article "Upon the Influence of Intraocular Pressure upon the Circulation in the Eye." The questions presented in the article are difficult, as involving the consideration of the laws of hydrodynamics. An experiment related is, however, of sufficient interest to be cited. "A loop was thrown around the upper extremity of the superior cava of a dog, and all descent of blood from the head at once arrested. The loop was kept tight for a minute, and neither at the time of tightening, nor during the period of constriction, nor when the loop was relaxed, was there the slightest change in the diameter or fullness of the central vessels. The experiment was repeated on a white rabbit with the same result; and the author concludes *that the eye is a sphere filled with fluid in such a manner that the pressure exercised upon it by the complete arrest of its venous current does not suffice to render it any fuller than before.*" A purely mechanical hyperæmia of the inner membranes of the eye, apart from pathological change, he considers an impossibility. The consideration would, however, suggest itself that a venous obstruction, even if not directly

[1] Klin. Monatsbl., Nov. and Dec., 1867. [2] Archiv f. O., xi., 2.

causing hyperæmia, would retard the circulation, and in this way might lead to pathological changes admitting of hyperæmia.

Accommodation.—Herisen and Voelckers have given a full description[1] of their experiments upon accommodation of the eye in dogs, some account[2] of which has been previously published. From a notice of their pamphlet in the Klinische Monatsblätter (1868) we gather—

1st. Dilatation of the pupil in the dog is caused by irritation of the sympathetic in the neck, and of the sympathetic fibres lying upon the optic nerve—those which do not pass through the ciliary ganglion.

2d. Contraction of the pupil takes place upon irritating the ciliary ganglion; there occurs at the same time a retraction of the periphery of the iris and a prominence of the edge of the pupil.

3d. After removal of the ganglion, the effect of atropine upon the iris is unchanged.

4th. Upon irritating the ganglion the choroid, as shown by being laid bare, becomes prominent and drawn forward by the action of the ciliary muscle.

5th. With the movement of the choroid that of the retina occurs at the same time; in case of accommodation this movement is toward the pupil. This accounts for the phenomena of the so-called accommodation phosphene (of Czermak), and of the unfavorable influence of the accommodation in retinal and choroidal diseases.

Symptotic Points.—Prof. Listing, of Göttingen, has called attention to "Some Remarkable Points in Lenses and Systems of Lenses."[3] Although the communication appeared in 1866, we take the liberty of mentioning it here, not having seen it noticed before. He shows that, in accordance with the familiar formula for conjugate focal points, it may happen that the object point and image point coincide in one point of the axis, and he calls points in which this is the case *symptotic points* of the lens or system of lenses.

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[1] Experimental untersuchung über den Mechanismus der Accommodation. 60 Leiten mit 2 Tafeln. Kiel, 1868.

[2] Centralblatt für die Med. Wissenschaften, 1866, No. 46.

[3] Poggendorff's Annalen 1866, Vol. cxxix.

Ophthalmic Inflammation after Injury of the Fifth Nerve.—The American Journal of the Medical Sciences for January, 1868, contains some remarks, derived from the Journal of Anatomy and Physics, November, 1867, on Ophthalmic Inflammation after Division of the Fifth Nerve. They represent that after injury of the fifth nerve in animals, the usual inflammation of the eye may result, notwithstanding the preservation of the sensibility of the eye and its appendages.

Field of Vision.—Foerster has communicated[1] a paper on "Measurements of the Monocular Field of Vision, in different Diseases of the Retina and Optic Nerve." He measured the angular distance of points of the periphery of the field of vision from the spot of Mariotte. This latter is nearer to the centre of the normal monocular field of vision than the point of fixation is; it also corresponds to the papilla, from which the retinal nerve-filaments radiate, and so may be supposed to sustain some relation to certain defects of the visual field. Foerster finds there is a relation certain and characteristic between the configuration of the visual fields and the different diseases of the nervous apparatus of the eye. For the interesting details we must refer to the original article.

Etiology of Myopia.—Cohn[2] examined the eyes of 10,060 school children, and has given us a valuable contribution to the etiology of myopia. From a comparison of the results of the examination, it appears that myopia was promoted by the school habits and school arrangements of the scholars examined. The opinion is confirmed that long continued use of the eyes on fine objects by poor light, and with unfavorable position of the body, tends to cause and increase myopia.

Epidemic Ophthalmic Disease.—Sir W. R. Wilde describes, in the Medical Times and Gazette, February 1, 1868, a hitherto undescribed epidemic, which has recently prevailed in Ireland. The description is given also in the American Journal of the Medical Sciences, for April, 1868. As both these journals are easily accessible, it is not necessary to repeat the description

[1] Annales d'Oculistique, January and February, 1868.

[2] Untersuchungen der Augen von 10,060 Schulkindern, nebst Vorschlägen, &c. Leipzig, 1867.

here. The disease reminds one of irido-choroiditis accompanying cerebro-spinal meningitis.

Hutchinson[1] has given some "Statistical details of three years' experience in respect to the Form of Amaurosis, supposed to be due to Tobacco," from which we make some extracts.

"The cases which form the subject of this paper are recognized by the loss of vascular supply to the optic nerve itself. There is not usually much diminution in the size of the vessels which supply the retina, and often these remain of good size when the nerve itself is as white as paper. The first stage (one which is usually very transitory, and perhaps often altogether omitted) is one of congestion, during which the disk looks too red. Then follows pallor of the outer half of the nerve disk, that part which is nearest to the yellow spot. During these stages the patient complains of dimness of vision merely. Every thing seems in a fog to him, but he has no pain in the eyes, nor any photophobia, or photopsiæ. In a later stage the whole of the optic disk has become pale, even to a blue-milk whiteness; and later still there is proof, not only of anemia of the nerve, but of advanced atrophy. The stages usually occupy from four months to a year. In many cases the patient becomes at length absolutely blind, but in others the disease, having advanced to a certain point, is arrested. There is from first to last no evidence of disease of any structure in the eyeball, excepting the optic nerve; and even after years of absolute blindness, the retina, choroid, &c., remain healthy, and their blood supply good. Almost always both eyes are affected, and progress almost *pari passu*. Sleepiness, a little giddiness, and a little headache are usually the only constitutional symptoms which attend it, and these disappear at a later stage and the patient regains his usual health. As there is no tendency to fatal complications, opportunities for *post mortem* examination of the brain are scarcely ever obtained."

"White atrophy of the optic nerve is observed in another class of cases which are quite distinct from those which are the subject of this paper, but which, under certain conditions,

[1] Medico-Chirurgical Transactions. Vol. 50. Second Series, Vol. 32. London, 1867.

are distinguished from them with difficulty. I allude to those in which the atrophy is secondary to acute inflammation of the nerve-structure."

"Neuritis is common in children and women, whereas primary atrophy is, I believe, almost unknown in children, and very rare in the female sex."

"My present report comprises thirty-seven cases. In all, the patients were adults, and at ages varying from 21 to 56, and averaging 40. Almost all the patients were in good health, and in but few had there occurred at any stage any symptoms of cerebral disorder apart from the amaurosis. None of them were paralyzed in any way, and none of them presented any material defect in hearing. In most there was the history of some frontal headache, slight giddiness, &c., at the time the first defect of sight was noticed; but in none had these symptoms been severe, and in almost all they had ceased as the amaurosis advanced. Of the thirty-seven cases, thirty-four occurred in men, and three in women—thus remarkably confirming the conclusion on this point arrived at in my former paper."

"During the last three years I have held it to be a bounden duty to warn all who present the symptoms of this disease against smoking, and in only a few instances (provided the patient was seen early) did the disease afterward progress to blindness."

Virchow[1] has given an interesting account of struma exophthalmica. "There always remain the three intimate symptoms or triad: affection of the heart, the thyroid gland and eyes (orbital-polsters, orbit cushions) as the regular, although, in relation to each other, not constant phenomena, and it may be asked what the explanation of this combination is." "Certainly the direction of the inquiry turns, even as in the question of the connection between disease of the supra-renal capsules, bronze skin, and other cases, more and more to the nerves themselves, while there still exists too little material for enabling us to arrive at a decision." "At least there can no longer be any hesitation in acknowledging the intimate

[1] Die Krankhaften Geschwulste. 21st lect. 3d vol., 1st half, p. 73. Translated by J. Warburton Begbie, in the Edinburgh Medical Journal, April, 1868.

nervous dependence of the complex symptoms as the only probable view." "In what particular portion of the nervous system the original seat of the disturbance, and what the disturbance itself is, that must first be more accurately established; and the inquiry must be made also, whence, from what source (whether from the blood) the disturbance has been developed." As to the treatment: "Sometimes the preparations of iron have effected this (a cure), sometimes digitalis; it is seldom that iodine is useful. The best consequences have succeeded the employment of cold-water treatment, sea-bathing, and an invigorating diet." The translator observes that "It cannot be too distinctly stated nor too carefully borne in remembrance that in this disease iodine is an unsuitable remedy; its administration, so valuable in ordinary goitre, is, in the 'struma exophthalmica,' not only useless but injurious. From *iron*, *digitalis* and *belladonna*, discriminately employed, and from the steady perseverance with an invigorating plan of treatment, the best effects have been found to follow."

In the British and Foreign Medico-Chirurgical Review for January, 1868, in a review of certain ophthalmological publications, some account of recent views on sympathetic ophthalmia is given, a portion of which is worth reproducing here. Dr. Maats[1] recognizes at least three kinds of sympathetic disease of the eye, namely, sympathetic irido-cyclitis, sympathetic serous iritis, and sympathetic neurosis. Sympathetic irido-cyclitis corresponds to Mr. Lawson's second form, "the severe disease now so well known as sympathetic ophthalmia." According to von Graefe a less dangerous simple serous iritis may be developed as a sympathetic ophthalmia, and Critchett coincides with this observation. The third form of Dr. Maats, the sympathetic neurosis, corresponds to the sympathetic irritation of Mr. Lawson. Of his sympathetic neurosis he says that, while it may, for the time, entirely disable the eye, it has no tendency, however long continued, to produce any structural change, and that it is cured, immediately and perfectly, by the removal of the eye causing the irritation.

Dr. Maats is inclined to think that the cases described by

[1] Annual Reports of the Netherlands Ophthalmic Hospital. By F. C. Donders. 1863–6.

writers, in which sympathetic ophthalmia, *actually established*, is said to have been arrested by the removal of the eye first affected, were really examples of irritation only. His experience teaches him that established sympathetic irido-cyclitis possesses an obstinate vitality of its own, quite independently of the cause in which it originated.

Besides these three forms, he calls attention to and briefly discusses cases of "doubtful sympathy," and the question how far, apart from injury, the occurrence of sympathetic ophthalmia may be occasioned by internal inflammations, glaucomatous processes, etc., etc. On these points he arrives at no very definite conclusions, quotes von Graefe to the effect that the hypothesis of sympathetic influence should be accepted with great reservation, but not wholly excluded, etc.

Dr. Maats gives an account of the dissection of eighteen enucleated eyes. Of these the first two had actually excited destructive irido-cyclitis of their fellows, which had gone on, in spite of treatment, to complete blindness. In both cases one of the ciliary nerves was found actually engaged in the cicatrix at the seat of injury, and more or less adherent to the coats of the eye and to the effused lymph. The remaining sixteen eyes were all removed because they were useless and painful, but none of them had excited sympathetic ophthalmia, and only a few a small degree of sympathetic irritation, which was relieved by the operation. The morbid appearances were, of course, various; but in none of them was there any special implication of any ciliary nerve in a cicatrix or an inflammatory deposit. The ciliary nerves were in many cases more or less changed or degenerated in structure, charged with oil-globules and the like, but not in any decided way involved in the disease.

The next number of the same journal, that for April, 1868, gives the opinions of Dr. E. Meyer on this subject, taken from the Annales d'Oculistique for September, 1867. A part of the account we copy here.

"Of the two hypotheses which have been advanced to explain the pathogenic action, excited by the injured eye upon the sound one, M. Meyer believes that while the optic nerve and its decussation may, in some instances, be the channel of

transmission, this is in a far greater number to be sought for in the ciliary nerves. The affection by no means presents the same serious symptoms and the same pathological changes in all cases, and may especially exhibit itself in three forms. 1. The most dangerous of these is that known as *malignant iritis* or *irido-cyclitis*, which, coming on days, weeks, or even months after the injury, leads to the deposition and organization of false membranes behind the iris, uniting it in a very solid manner to the capsule, and producing complete immobility of the pupil. There is excessive sensibility in the region of the ciliary body, and eventually the globe softens, complete blindness ensuing. Treatment can here do little. Enucleation of the injured eye after the irido-cyclitis is developed is of no avail, and its only chance of success is its employment before any sign of inflammation is present. Iridectomy is of difficult execution and doubtful benefit.

" 2. Ordinary *serous iritis* is the second form observed, the pupil continuing to dilate, though perhaps somewhat irregular from slight adhesions. The aqueous humor is turbid, and the globe is rather tense. Although this form is very obstinate, it does not lead to irido-cyclitis. The vitreous humor generally remains intact, and in these cases enucleation, being attended with complete success, should never be neglected.

" 3. The slightest form of the affection may be appropriately termed a *sympathetic neurosis*. It is characterized by considerable photophobia, with consecutive spasm of the orbicularis, slight injection around the cornea, weeping, a want of energy in vision, and defective power of accommodation. Enucleation would here be also a remedy, but the author, acting on the suggestion of von Graefe, has in three instances which have come under his notice resorted with complete success to the section of the ciliary nerves, and he recommends that the operation should be performed when, from the sensibility of the ciliary region to the touch, sympathetic ophthalmia is to be apprehended, practicing it, indeed, before any symptom of the sympathetic affection has appeared."

Meyer describes[1] the operation as follows :

[1] Congrès Periodique International d'Ophthalmologie. 3d Session. 1867. Paris, 1868.

"At the part painful on being touched, at which the section of the ciliary nerves is to be made, a fold of conjunctiva near the border of the cornea is raised, just as in the operation for strabismus; this is incised; the point of the blunt scissors is introduced between the conjunctiva and the sclerotic, and the cellular tissue which unites the two membranes is divided. A strabismus hook is then introduced under the rectus muscle nearest to the incision; the eye is thus held, while at the same time we determine the position of the insertion of the tendon of the muscle; this latter is to be avoided. Then, holding the hook with the left hand, we puncture, with the narrow knife of von Graefe, in the ciliary region, the sclerotic obliquely to its surface, and without injuring the lens. The counter-puncture is made in such a way that, when the section is completed, we have a linear wound parallel to the border of the cornea, and in which the vitreous humor shows itself immediately. The hook is carefully withdrawn, and the operation is terminated. The tips of the wound remain several days before being completely united, and in one case I was even obliged to incise on the third day the vitreous, and to continue the compressive bandage for more than a week. The reaction of the eye after the operation is very moderate, and requires only rest (subcutaneous injection of morphine in the temple in case of pains or sleeplessness) and the compressive bandage."

We give the description of the above operation as one which has been proposed, but for which further confirmation of its merits is desirable.

Action of Crystallized Sulphate of Soda on Stains of the Cornea.—De Luca, of Naples, recommends,[1] for the removal of corneal opacities, the crystallized sulphate of soda. This is to be applied either in solution (saturated when cold), or better in powder, directly upon the eye. He has observed that laudanum and the tinctures, as well as astringent solutions, such as tannin, produced by their action on the eyes stains which persist under all ordinary treatment. These alcholic and astringent substances coagulate the albumen of

[1] Edinburgh Medical Journal. March, 1868.

the tissues, which in this manner lose their natural transparency.

Removal of staphyloma and closure of the wound by conjunctival sutures. Prof. Knapp has proposed[1] a change in Crichett's operation for removal of staphyloma. He had been informed, at Moorfield, that after this operation sympathetic irritation with exudative iritis of the other eye, rendering it necessary to extirpate the previously staphylomatous eye, had been observed. He therefore proposes to substitute conjunctival instead of scleral sutures to close the wound. He endeavors, in passing the needle, to include as much as possible of the conjunctiva and subconjunctival tissue, in order that the conjunctiva may slip as little as possible over the sclerotic in tying the sutures, and so that the lips of the wound may be brought into good apposition.

Prof. Graefe has written a third[2] article on the Modified Linear Extraction. In it he advises certain changes in the mode of doing the operation; for instance, the cataract is to be got out, not by the so-called "sliding manœuvre," but by a peculiar mode of pressing with a caoutchouc spoon on the outside of the cornea. The convex surface of the spoon is first pressed against the lower edge of the cornea, and, while exerting the pressure, is made to move for the distance of a half of a line or so, from below upward, at the base of the cornea, during which the upper edge of the lens comes forward into the section. The convexity of the spoon is now pressed in a direction towards the centre of the eye, and then, in proportion as the lens comes along, in a direction more and more toward the upper edge of the cornea, till finally it moves nearly tangentially upward on the corneal surface, whereby it presses, as it were, the lens up to and out of the opening.

In 230 cases treated in the method referred to, he was only twice compelled to use a traction instrument, and lost vitreous only nine times.

Another change consists in making the section somewhat less steep. He considers it results from Weber's[3] experiments,

[1] Archiv f. O., Vol. xiv., Abth. i.

[2] Archiv f. O., Vol. xiii., Part 2. 1867.

[3] Archiv f. O., Vol. xiii., Part 1.

that large linear sections made in this way (less steep) close better, and this is especially important if the tension of the eye is increased. He also thinks this change in the section suits better the new mode of pressing out the lens.

As regards the size of the opening, he considers 5‴ better than $4\frac{3}{4}$‴ for cataracts which are thick and hard, and notwithstanding an occasional misproportion between the size of the lens and the opening, he prefers not to remove the ends of the incision further from the edge of the cornea, nor to make use of a flap of greater height. In his first article (Archiv f. O., Vol. xi., Part 3), the ends of the section are to be $\frac{1}{2}$‴ from the edge of the cornea, and $\frac{2}{3}$‴ below the level of the top of the cornea, this giving externally a length of section of from $4\frac{1}{2}$‴ to $4\frac{3}{4}$‴.

Prof. Knapp[1] has reported a second hundred extractions by Graefe's method, which he calls the "Lineal Section in the Scleral Border." Among these were two cases of the suppuration of the cornea, with panophthalmitis, each after a normal operation without the least accident. He recommends, in accordance with the practice at Moorfield's, in London, the early discision of pupillary capsular opacities. He had done this in the second and third weeks after the extraction. The vision was always improved and the operation generally without irritation. The membranes could be more safely and easily divided thus early, as at this period they offered less resistance. He proposes to observe carefully the safety of this early discision, the best time for it, the anatomical conditions allowing of it, and the improvement of vision obtained by it.

The results of the 100 cases were as follows:

Failures	2
Imperfect (vision $\frac{1}{12}$ to $\frac{1}{100}$)	12
Perfect (vision $\frac{1}{2}$ to $\frac{1}{10}$)	86

These results were observed only a few weeks after the operation. Subsequent improvement occurred in many cases, sometimes to a considerable degree.

It should also be stated that Knapp prefers to do the operations for secondary cataract (and sometimes other eye-opera-

[1] Archiv f. O., Vol. xiv., Part 1.

tions) by artificial, oblique illuminations—being able in this way to see better the membranes to be divided and the effect of the movements of the needle.

Graefe's Linear-shaped Cataract-knife.—We may also be allowed to mention, as an addition to the armamentarium of the oculist, the slender linear-shaped cataract-knife introduced by Graefe, for his modified linear extraction; this knife being also useful in performing iridectomy in glaucoma, with dilated pupil or shallow anterior chamber, and in some cases of old irido-choroiditis or irido-cyclitis with the anterior chamber nearly obliterated.

Astigmatism.—We desire also to mention, as a valuable addition to our art, the method recently introduced by a member of this society, of examining for astigmatism by means of a distant disk, placed at right angles to the line of vision of the patient, and marked with lines radiating in various directions.

Section of the Optic Nerve.—Prof. Graefe[1] has performed the section of the optic nerve as a remedy for distressing luminous sensations occurring after the loss of sight of an eye. Besides this class of cases, he thinks the operation also indicated in the treatment of certain intraocular tumors, in order to prevent the disease from extending backward along the optic nerve. It is to be done just before the enucleation, as it is difficult to resect the free end of the nerve just after an ordinary enucleation. Accordingly, in intraocular glioma, sarcoma and carcinoma, he considers it prudent to first perform the subconjunctival section of the nerve, as far as possible behind the eye, and then immediately to enucleate.

The Operation.—"The globe of the eye being drawn forward so as to project out of the orbit, the cellular fatty tissue of the orbit is entered by a puncture through the temporal portion of the conjunctival sinus. The instrument to be used is a very strong, moderately curved nevrotome, which is to be passed along the external wall of the orbit until the point is sufficiently advanced to be passed across the optic nerve. The nerve, stretched by the (exophthalmic) position previously given to the globe, presents itself easily to the concavity of the

[1] Congrès Periodique International d'Ophthalmologie. 3d Session, 1867. Paris, 1868.

nevrotome, and the section is made according to the rules of subcutaneous tenotomy. The section can be made at a greater or less distance behind the globe, but most conveniently at a distance of from 6 to 8 millimetres; it can, however, also be made only a few lines in front of the optic foramen.

Thus a few of the many contributions of the last year have been mentioned. To notice them all here would not be practicable, however desirable. We must, however, refer, in addition, to a valuable Report on Ophthalmology by Prof. Noyes in the N. Y. Medical Journal for February, 1868, and also to the journals of the past year, devoted to our special department, especially the Klinische Monatsblätter, in the number of which for April and May, 1868, the ophthalmological bibliography for 1867 is given.

Among the many publications relating to our branch of medicine especial mention should be made of the following:

1. Mooren's "Ophthalmiatrische Beobachtungen." Berlin, 1867. The preface of this informs us we are not to expect a systematic treatise on the various subjects of ophthalmology, but only a short explanation of those views upon treatment and operations which have been developed in the course of an extensive practice of ten years. The book touches upon most matters of interest to the practitioner.

2. Bericht über die Augenklinik der Wiener Universität. 1863–1865. (By Drs. Tetzer, Rydel and Becker, with the cooperation of Prof. Arlt.) Wien, 1867. This report, emanating from a large eye clinic at one of the principal medical centres of Europe, is, without doubt, a valuable contribution to the records of ophthalmic observation.

3. Power's "Illustrations of some of the Principal Diseases of the Eye, with a brief Account of their Symptoms, Pathology and Treatment." London, 1867. Mr. Power proposes to give, in addition to the pictured illustrations, a very concise view of the pathology and surgery of the eye, omitting generally such subjects as appeared to be matters of curiosity or rarity only, and also all details with which it seemed reasonable to suppose that every surgeon would be familiar.

4. Die Bestimmung der Refractionsanomalien mit Hilfe des Augenspiegels, von Dr. Ludwig Mauthner. Wien, 1867. This

pamphlet is an edition, in separate form, of the sixth chapter of his text-book of Ophthalmoscopy, published at the same time. The importance of the subject is manifest.

In addition to the above, two text-books of ophthalmology have appeared during the last year—Bader's[1] and the third edition of Stellwag, with its American translation.[2]

With respect to the first of these the author had in view a book adapted for the wants of the student, and which should also afford to the practitioner a faithful record of the present state of this branch of medical science. The book is carefully written, and appears in general to correspond well to the objects of its author. It numbers 505 well printed large octavo pages. Some plates are added in a separate volume.

With Stellwag's book gentlemen are probably familiar. The fact that three editions of this comprehensive and elegant treatise have been issued within seven years, is one of the evidences of the interest felt in our department of medicine. A comparison of the first and last edition, with their differences, will show the difficulty of writing a text-book on the subject amid the very many alterations and additions which have all along been taking place.

We may perhaps, also, be allowed to mention Wundt's "Handbuch der Medicinischen Physik," Erlangen, 1867, although it is not exclusively devoted to ophthalmology. It proposes to give an account of physical science in general, and to explain its applications to medicine. The book is in large octavo, printed in large type, and numbers 555 pages; about one-third of it is devoted to the subject of *Light*. Inasmuch as physical science must be consulted by the medical practitioner, a book like this promises to be very acceptable.

Advances in ophthalmology ought to include corresponding improvements in the results of treatment, though the period of a year is too short to establish these satisfactorily. If we

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[1] The Natural and Morbid Changes of the Human Eye and their Treatment. By Charles Bader, Ophthalmic Assistant Surgeon to Grey's Hospital. London, 1868.

[2] Treatise on the Diseases of the Eye, including the Anatomy of the Organ. By Carl Stellwag von Carion, M.D., Professor, etc. Trans'ated by Chas. E. Hackley, M.D., and D. B. St. John Roosa, M.D., etc. New York, 1868.

take into consideration a longer period, it may safely be said that the ophthalmoscope, the operations of iridectomy, enucleation, and others, the modern doctrines of the physiology of vision, together with the advance in general medicine, have brought about improvements in the results of ophthalmic treatment, though many desiderata still remain; among them, improvements in the treatment of conjunctival diseases, which incapacitate from labor so many persons.

As to the education of ophthalmic practitioners, the attention given to it in Europe is sufficiently well known. The value of ophthalmological knowledge as a part of medical education in general is evident, not only for its use in preserving the special sense of sight, but because ophthalmic symptoms accompany many diseases of other parts of the body. Its importance is becoming yearly more recognized in this country, as appears from the increased number of courses of lectures on the eye in our medical schools.

Dr. Noyes then presented the following:

Observations in Astigmatism. By Henry D. Noyes, M.D., of New York.

I have selected from my case-book a few noteworthy cases of astigmatism, intended to show how great is the variety of refractive disturbance, and how often the eyes are unlike.

In cases of presbyopia, and also often in myopia, one glass would be needed for distance and another for near work. It is interesting to know that in instances where the difference between the two eyes was very great, and naturally the retinal images would differ in size, even after correction, that the patients were cured of painful symptoms and enabled to enjoy comfortable binocular vision. I have not detailed the previous history of the cases, nor stated what was the degree of vision before the astigmatism was corrected. My design is to show the importance of making an exact correction of each eye by itself, not doubting that when each is made as perfect as possible it will be ready to co-operate with its fellow in binocular vision.

The mode of testing was partially by Green's tables and

partially by Javal's optometer. The direction of the axis of the cylinder is always given according to Javal's notation—taking the upper half of a circle and counting the degrees from left to right from 0° to 180°.

Cases of astigmatism, with unequal refraction of the two eyes.

Mrs. McL., æt. 48:

Right, + 1-24 sph. — 1-9 cyl. 25° vis. = 20-20 } distance.
Left, — 1-12 sph. — 1.9 cyl. 45° vis. = 20-50 }

Right, + 1-9 cyl. 120° } reading.
Left, — 1-9 cyl. 45° }

Mr. A., æt. 18:

Right, — 1-7 sph. — 1-10 cyl. 180° } distance.
Left, — 1-5 sph. — 1-10 cyl. 180° }

Right, — 1-24 sph. cyl. — 1-10 } reading.
Left, — 1-9½ sph. cyl. — 1-10 }

Been operated on right external rectus for insufficiency, and cured.

Miss N., æt. 22:

Right, + 1-16 cyl. 90° vis. = 20-40.
Left, + 1.42 cyl. 45° vis. = 20-50.

Miss B., æt. 20:

Right, + 1-48 sph. + 1-24 cyl. 45° vis. = 20-40.
Left, + 1-16 sph. vis. = 20-80.

Great relief from pain in reading; time, three hours.

Miss C., æt. 32:

Right, — 1-48 cyl. 120° vis. = 20-20.
Left, + 1-36 sph. — 1-18 cyl. 75° vis. = 20-20.

For left, ordered — 1-18 cyl.

Mrs. C., æt. 33:

Right, E vis. = 20-20.
Left, + 1-42 sph. — 1-16 cyl. 165°, 20-20.

Mr. A., æt. 14:

Right, + 1-36 cyl. 30° vis. = 20-20.
Left, E.

With this glass reads comfortably; without, has had asthenopia.

Miss H., æt. 25:

Right, — 1-16 sph. — 1-18 cyl. 135° vis. = 20-20 (?) } distance.
Left, — 1-16 sph. — 1-48 cyl. 80° vis. = 20-30 }

Right, — 1-18 cyl. 135° } reading.
Left, — 1-48 cyl. 80° }

Dr. Pomeroy related the following:

Case of Acquired Astigmatism.

A. L., aged thirty-eight, an artist by profession, complained that for about five years objects had appeared elongated and indistinct, together with an inability to use his eyes long at a time without pain. The difficulty was so great as to compel him to give up portrait painting.

Previous to this affection he was in the habit of making sketches of places, and testing their accuracy by comparison with photographs of them. So he feels sure his eyes were perfect at this time.

He first noticed this strange behavior after painting miniatures for some time by the aid of an imperfect convex lens. (Even if the lens were perfect, the fact that it is often held obliquely may be sufficient explanation of the mischief.) His vision was $\frac{1}{2}$; but with a —15 cylind. lens in the vertical meridian, vision was 1 and accommodation normal—*i. e.*, reads "No. 1 Jaeger at $3\frac{1}{2}$."

With these glasses he has worked for more than a year, sometimes using them twelve or fifteen hours a day, without pain to the eyes.

There is still a little *dancing* of the lines in Green's plates, when the head is tilted from side to side, but it does not seem possible to resolve the case more perfectly with the means at our command.

Dr. Henry W. Williams, of Boston, read the following paper, and presented the probes for inspection, at the meeting of 1867.

Modification of Probes for the Lachrymal Passages. By H. W. Williams, M.D., of Boston.

There can be no question that Mr. Bowman's plan of treatment of obstructions of the tear passages, by dilatation by means of a graduated series of probes, after enlargement of the puncture so as to admit of their introduction, is to be regarded as a great advance upon the means previously in use.

But, if not bent so as precisely to correspond with the di-

rection of the duct in the individual operated on, these probes often lacerate the mucous lining of the passages, causing pain and hemorrhage, and retarding the cure by exciting local inflammation.

I have, therefore, devised a simple modification of these probes, having them made flexible, that they may adapt themselves to the sinuosities of the lachrymal canal, in order to avoid the accidents referred to; and I have found in practice that such probes could be introduced with more facility and less pain, and were less likely to take a wrong direction.

These modified probes have bulbous extremities, of the sizes of Bowman's series, but are slender for one-third of the distance from the bulb to the flat disk at their middle. They should be made of alloyed silver, that they may have an elastic flexibility without being liable to bend upon themselves in encountering obstructions, as would be the case were the silver too pure.

On the Use of Styles of Lead in the Treatment of Disease of the Lachrymal Sac. By John Green, M.D., of St. Louis, Missouri.

Metallic styles, worn for a longer or shorter time in the lachrymal sac and nasal duct, have been long used in the treatment of obstructions of those passages.[1] They are now always inserted through the upper or lower canaliculus, or through an artificial opening made by slitting up the canaliculus into the lachrymal sac. Of modern surgeons, Dr. E. Williams, of Cincinnati, U. S., has employed this method with the greatest success, and has established it as one of the surest as well as most convenient modes of treating lachrymal obstructions. Dr. Williams employs styles of about eight sizes, ranging from .035 to .12 inch, or from the size of No. 3 of Mr. Bowman's series of probes to a diameter of about double that of No. 6; the styles are of silver, and are introduced through an opening into the lachrymal sac made by slitting open the upper canaliculus with a fine pair of scissors. He begins with a style as large as can be easily inserted, changing

[1] Scarpa, Ware, Travers, Hays, Bowman, E. Williams, etc.

to larger sizes as fast as the state of the parts will permit. During the whole course of the treatment the style is frequently removed and the sac and duct treated by astringent injections. The results of treatment by this method are extremely satisfactory, both as regards the length of time required and the ease and certainty with which the case is conducted to a successful termination; it is especially adapted also to the worst forms of obstruction, such as traumatic cases or cases complicated by fistula or by chronic thickening, granulation or distention of the sac.

By this plan of treatment by rigid styles of silver, experience has shown that it is necessary to use styles of large diameter, in order to guard against a speedy return of the obstruction. This would seem to arise in part from the fact that the silver styles are too rigid easily to accommodate themselves to the direction of the duct, as is shown by the degree of resistance which is often experienced in passing them, and that they therefore exert unequal pressure upon its bony walls. The style, instead of lying loosely in the middle of the canal, is in fact by its elasticity exerting constant pressure upon a few points; it tends, therefore, to produce ulceration of the lining membrane, together with partial absorption and ultimate change of form in the bony walls. The canal must, in short, be brought into the form of a strictly cylindrical tube before the style can begin to distend it uniformly and exert that equable pressure upon the mucous membrane which is essential to its beneficial action. These points are, I believe, sustained by the experience of most surgeons who have used rigid styles in the treatment of lachrymal obstructions.

Having had an opportunity, through the courtesy of Dr. Williams, to observe a considerable number of cases treated by his method, and subsequently reflecting upon the mode in which the curative effect of the styles is attained, the writer was led to the conclusion that the period of treatment might be materially abridged, and with increased comfort to the patient, by the substitution of flexible styles of lead for the rigid ones of silver hitherto employed. The experiment was tried upon an extremely unpromising traumatic case, complicated with abscess of the sac, and with a result so gratifying as to

lead to further trials, which have all proved highly satisfactory. The careful observation of the progress of the few cases in which the flexible leaden styles have been used affords good reason for trying the plan further, in the hope that it may prove to be a valuable addition to our means of treatment.

The apparent advantages of this method are briefly these.

1st. The leaden styles may be worn with the maximum degree of comfort and with the minimum risk of trouble from unequal pressure.

2d. Under their use the discharge from the sac soon becomes mucous and rapidly disappears, without medication of the sac by syringing or otherwise.

3d. A less degree of dilatation, by the use of a smaller size of style, answers for the completion of the cure, thus enabling us materially to abridge the period of treatment.

4th. The toleration of the style and the favorable progress of the cure, without further treatment, enable us, in certain cases, to dispense with the assiduous attention which is so essential with other methods. This plan works particularly well, therefore, in cases where patients are irregular in attendance, and where, for any reason, but a short time can be spared for treatment.

The styles used have been made from the purest and softest lead, drawn into wire of sizes ranging from one to two millimeters (1-24 to 1-12 inch) in diameter. These sizes correspond, in the lower numbers, to Nos. 4 to 6 of Mr. Bowman's scale of probes, and to Nos. 20 to 17 of the wire gauge as used by Dr. Hays. In the larger sizes they exceed the maximum (No. 6) of Mr. Bowman in the ratio of 2 to 1.3, and the largest probe used by Dr. Hays (No. 17 of the wire gauge) in the ratio of 2 to 1.5. They are smaller than the maximum sizes used by Dr. Williams, in the ratio of 2 to 2.9, and they are probably smaller, also, than the largest styles which he commonly employs. Larger sizes, ranging from two to three millimeters in diameter, have not as yet seemed to be needed.

To make the styles from the leaden wire, it is cut into lengths of two inches for the upper canaliculus; if intended to be passed by way of the lower canaliculus, they should be about a quarter of an inch shorter. One end of the style is

carefully rounded with a penknife, and smoothed by scraping. They are made perfectly straight, as they are more easily introduced in this form; the upper end is bent over into a hooked form by means of forceps, after the style is placed in position. The smaller sizes are introduced with great difficulty unless a way has been prepared for them by wearing a rigid style of silver for a few hours, or perhaps for a day or two; after this there is no further trouble in exchanging the old style for the next larger, provided only that we take care to introduce the new one immediately upon the withdrawal of the old. The largest sizes (of from two to three millimeters in diameter), if used, will be found rather heavy; they should, therefore, be drawn in the form of tubes, instead of solid wire. The smaller sizes might also, perhaps, be made tubular, and their introduction facilitated by passing a fine steel wire into the cavity. Where elegance is an object, the styles may be easily silvered or gilt.

The following table represents the sizes of the leaden styles, together with those of the probes and styles of the different scales most in use.

Millimeters.		
	.6	.6 millimeter to 1.3 millimeters = Nos. 1–6 of Mr. Bowman.
	.7	
.8 millimeter to 1.5 millimeters = Nos. 21–17 of wire gauge as used by Dr. Hays.	.8	
	.9	
	1.0	
	1.1	
	1.2	
	1.3	
	1.4	1 millimeter to 2 millimeters = Nos. 4–8 of leaden styles.
	1.5	
	1.6	
	1.7	
1 millimeter to 2.9 millimeters = Nos. 4–10 of Dr. Williams.	1.8	
	1.9	
	2.0	
	2.1	
	2.2	
	2.3	
	2.4	
	2.5	
	2.6	
	2.7	
	2.8	
	2.9	

MYDRIATICS IN GLAUCOMA. *Two cases in which the instillation of atropine was directly followed by an outbreak of acute glaucoma.* By HASKET DERBY, M.D., of Boston.

In the Medical Times and Gazette (Vol. I., pp. 111, 112) Mr. Wharton Jones alludes to the ill effects produced in cases of acute glaucoma by the application of belladonna, and warns against its use.

Notwithstanding the unfortunate attitude assumed by this gentleman towards modern ophthalmology, as evinced in the last edition of his work on the "Principles and Practice of Ophthalmic Medicine and Surgery," his position and experience, as well as the absence of any direct proof to the contrary, entitle a statement of this kind to receive attention and be submitted to investigation.

In looking over all the accessible literature of glaucoma I am unable to discover any important facts bearing on this subject. The general inference to be derived from its perusal is that mydriatics, if powerless for good, are certainly harmless in their effects. In the earlier experiments of von Graefe[1] they appear to have been freely used without result. Other writers make little or no allusion to their employment. Mr. Watson[2] relates a case where atropine restored the translucency of the media. In the cases treated by von Graefe, as well as in this instance, the disease had of course fully declared itself. Since reading the statement of Mr. Jones two cases of acute glaucoma have come to my knowledge, in each of which the instillation of atropine was directly followed by the outbreak of the violent symptoms—a development of disease that in the one instance had lain dormant, in the other had not even been suspected. And I bring them forward on this occasion, not for the sake of basing any theory on facts that are too limited in number to afford a sufficient foundation therefor, but to call the attention of ophthalmologists to the consideration of the question which follows:

Whether the use of mydriatics may occasion an access of acute glaucoma in an eye already predisposed to the same?

[1] Archiv für Ophthalmologie, Bd. 3, Abth. 2, s. 488.

[2] Ophthalmic Hospital Reports, Vol. iv., p. 449.

For the following history I am indebted to my friend, Dr. Althof, of New York, in whose practice the case occurred.

Case I.—Mr. P., æt. 43, consulted me in October, 1866. For seven years had noticed a " weakness of eyes."

On examination of each eye the cornea and iris were found in every respect normal. No symptoms of impaired circulation in vessels of conjunctiva. Anterior chamber rather shallow. Tension normal. No periodical obscurations or prismatic colors.

Vision = 1-7; presbyopia = 1-12. A rapid increase of this has been observed for two months; each field of vision concentrically limited.

Deep excavation of each papilla; vessels pressed downwards and inwards; pulsation produced by slight pressure.

Diagnosis.—Chronic glaucoma of each eye. After having explained the nature of the disease and the plan of treatment to the patient, he produced a letter from Professor von Graefe, from which it appeared that this gentleman had, two years before, made the same diagnosis and proposed the same treatment.

Patient still hesitated concerning an operation, and called, at my instance, on Dr. D. to learn his opinion. Here an application of a solution of atropine was made to the left eye, for the purpose of enlarging the pupil. The instillation of the liquid was attended by considerable smarting. One hour afterwards a tremendous attack of acute glaucoma came on. When I saw Mr. P. again the next day he was suffering great pain in the left eye, which was deeply injected and of stony hardness. Vision = 1-40.

After consultation with Dr. Agnew iridectomy was proposed, and performed the next morning on each eye. The left recovered slowly, convalescence lasting eleven days. There was a slight cystoid cicatrix. The wound in the right eye healed within twenty-four hours.

February, 1867. Right vision = 3-4; left = 2-3. Excavation has almost disappeared; uses his eyes constantly.

The next case came under my immediate observation.

Case II.—Miss B., æt. 62, consulted me March 21st, 1867. Her left eye had been attacked with what she considered a se-

vere neuralgic affection, the middle of last December. She stated that she had suffered severe pain and been confined to her room all the intervening time.

The left eye presented the usual appearances of absolute glaucoma, T. 3, engorgement of the ciliary vessels, cornea anæsthetic, pupil dilated and motionless. The fundus could not be made out. There was no perception of light.

The right was normal in every respect, there being no increase of tension and no interruption or impairment of the field of vision. The precise amount of vision was unfortunately not noted; the patient, however, asserted that she saw as well as ever, and had recently accomplished a large amount of writing, without difficulty or fatigue. The pupil being rather small, a single drop of a solution of sulphate of atropine (gr. j to ʒij) was applied. It caused neither pain nor irritation, and in half an hour the pupil was widely dilated. The fundus was throughout normal; no trace of excavation of the optic entrance was met with. There was marked venous pulsation, but moderate pressure failed to bring out any arterial.

The patient returned home and saw, according to her own account, as well as usual through the day, the dilatation of the pupil not appearing to cause any disturbance. Towards evening she took a short nap, and on awaking complained of dimness of vision and of subjective appearances of light. The next day she saw still more imperfectly, and now severe pain commenced, gradually increasing in intensity till she came to me the morning after.

It was now forty hours since my first examination. All the symptoms of acute glaucoma were present—anæsthesia of cornea, dilatation of pupil, extreme hardness of bulb and ciliary injection. The circumstances under which I saw her rendered the use of the ophthalmoscope impracticable. As regards vision she was barely able to follow the motions of the hand at a distance of five feet.

I operated within an hour, doing the iridectomy upward. The result was all that could have been desired, the eye returning to its former condition; vision = 1-2 a fortnight afterward. No traces of excavation remained.

Here, then, are two cases of acute glaucoma, in neither of

which the attack seemed imminent, and in each of which it so directly followed the application of the mydriatic as to be possibly attributable to it.

Experience and more extended observation can alone determine whether the statement of Mr. Jones be to any extent reliable. The cases above cited either go to sustain his position or furnish examples of a most curious coincidence. So important in glaucoma are the early ophthalmoscopic symptoms, such as slight changes of level at the edge of the papilla, and particularly arterial pulsation, and so frequently does it become desirable to dilate the pupil in order to satisfactorily determine their existence, that any facts tending to show the impropriety of the use of mydriatics would have a most important practical bearing.

Dr. Holmes, of Chicago, Ill., read an abstract of the history of forty-six cases of injury or disease of one eye, in fourteen of which total loss of vision in the second eye occurred from sympathetic ophthalmitis, apparently from neglect or ignorance of the physician in attendance, and in thirty-two of which extirpation was deemed necessary by Dr. Holmes to prevent the loss of the other eye.

In twelve of the cases of total blindness the sympathetic inflammation occurred at periods, after the primary lesion, varying in length from four and a half weeks to ten months; in one case the patient was permitted to suffer fifteen years from severe and frequent paroxysms of pain in an injured and useless eye, when the other eye became inflamed and atrophied.

In one case, soon after a piece of metal had been thrown into an eye, the second eye became inflamed and atrophied, vision being totally destroyed, and yet the subsequent removal of the foreign body was followed by quite good vision in the injured eye.

Extirpation was performed in twenty-seven cases less than six months after the primary lesion. In two cases of choroidal tumor, and in two cases in which a piece of metal had entered the globe, it was performed after the patients had suffered great pain almost constantly for two years. In one case a piece of percussion-cap in an eye had failed to produce sympa-

thetic ophthalmitis, although the injured eye was the seat of constant pain or tenderness on pressure for seven years.

In a large proportion of these cases the retina was detached from the choroid and situated in the central portions of the globe, either as a solid cord or as a floating membrane, in form not unlike an umbrella partially open.

Case of Encephaloid Tumor springing from the Fundus of the Eye-ball simulating Glaucoma. By Dr. Morton, of Philadelphia, Pa.

John Griffin, æt. 41, was admitted into the Wills Ophthalmic Hospital, Philadelphia, in February, 1866, suffering from what appeared to be *glaucoma*.

In March, 1865, he discovered accidentally that he was wholly blind in the left eye. No trouble of any kind occurred until the month of May following, when pain gradually came on, and soon became a prominent symptom, which increased to such an extent that he was obliged to give up all work. The pain was most severe at night, and the globe felt as if it would be forced out.

On admission there was complete opacity of the lens, the pupil was irregularly dilated and altered in color, a great amount of venous congestion, extreme tension of the ball, no perception of light, and pain almost constant, referred principally to the globe and back of the head.

The disease was thought to be glaucoma, and iridectomy was performed. Two weeks later, there being no relief, but rather an aggravation of the pain, I extirpated the eye-ball. On making a section of the globe, a pediculated, soft, white tumor was found which sprang from the fundus, about two lines from the optic papilla. The tumor occupied about one-half of the posterior chamber and was encephaloid in its character.

The optic nerve was uninvolved. With the removal of the eye-ball there was an entire relief of all pain, and no return of the disease since.

Dr. Loring, of New York, read the following at the meeting of 1868.

Relative Accommodation. By Edw. G. Loring, Jr., M.D.

It has been considered, for some time past, as established that there is a certain amount of independence between the act of convergence and that of accommodation. From this fact there has been a tendency among modern ophthalmologists to look upon the associated action of the ciliary and recti interni muscles as a combination of two separate forces agreeing to act, as it were, in unison to produce a given object, rather than a simple action, composed of two factors mutually dependent upon each other for the means of producing a common result. To such an extent has this idea of independent action been carried that the term accommodation is now universally applied to the function performed by the ciliary muscle alone. This custom of ignoring the part which the recti muscles play in the normal act of accommodation, evidently had its origin in the experiments instituted by modern observers in order to disprove the assertion that the accommodation was due to the action of the external muscles on the globe of the eye, as well as to refute the theory propounded by Porterfield, that there was an absolute connection between the convergence of the optical axes and the amount of focalizing power in the eye itself, or, in other words, that "to every degree of convergence there is a fixed and absolute amount of accommodation."

These experiments developed the fact that the action of the ciliary muscle, on the one hand, might be entirely annulled by actual paralysis, or that artificially produced by atropine, and yet the act of convergence remain undisturbed, while, on the other hand, it has been shown in one case,[1] at least, that all the external muscles may be paralyzed, and yet the range of accommodation remain unimpaired. Admitting that the conclusions drawn from both sets of these experiments are true, still the fact that one element in an associated muscular action may be either partially or totally suspended, while the other

[1] Graefe's famous case, Archiv für Ophthal., B. i., Abth. i., s. 299.

continues to perform its usual duty, does not prove that the two can act independently of each other when neither is subjected to any restriction—especially when such restriction has a pathological or artificial origin. This single objection against the arguments advanced above would be conclusive, if it were unanswerable. The answer to this is, that the independent action of the ciliary and recti interni muscles can be proved to exist, when the action of neither is subject to any restriction whatever—that is to say, when the functions of both are at the same moment physiologically perfect. The best proof of this assertion is the fact that a fine object can be placed at a given distance, consequently at a given convergence, and can then be distinctly seen with both eyes, both through convex and concave glasses, showing that the tension of the ciliary muscle can either be relaxed or increased while the convergence remains the same.

But admitting that the convergence *does* remain the same while the "accommodation is modified," it does not follow, as would at first sight appear, that this modification of the ciliary muscle is independent of or unaccompanied by a corresponding modification in the recti interni, or, in other words, it does not follow that these muscles do not sympathize in the different degrees of nervous impulse to which the ciliary muscle is subjected. On the contrary, *there is reason to believe that for every degree of nervous influence or increased tension of the ciliary muscle, there is a corresponding and contemporaneous nervous influence or increased tension for the recti interni, even if the optical axes remain fixed.* In order to prove this statement the following experiment was adopted.

Emmetropic eyes, with normal amount of vision and accommodation, were selected. Snellen's test type was placed at twenty feet, and a lighted taper was so arranged as to be at the level of the lowest line of letters (X X) and as nearly as possible on the same plane. The eyes being fixed upon the letters, the visual axes were practically parallel, and the tension on the interni as well as cilary muscle at the minimum. Binocular vision was proved to exist by means of prisms. Concave glasses of progressively increasing strength were then successively tried till a glass was obtained with which vision

began to be indistinct. A concave 1-16 was found to be the strongest glass through which vision was distinct for both eyes. With this glass binocular vision was also apparently perfect, as there was not a particle of diplopia or spreading of the letters or light. This glass represented, then, the amount of relative accommodation which could be called forth independently of convergence, for, as the axes were parallel, the tension on the interni must be at the minimum. If now, according to the assumption with which we started, every increased tension of the ciliary muscle is accompanied by a corresponding tension of the interni, this increased tension ought to show itself by increased convergence, which would then be expressed by diplopia. Here there was no diplopia; does the assumption fall to the ground? By no means, for if, under the above conditions, a colored glass was now placed before one eye, diplopia followed immediately with homogeneous images separated laterally twenty-three inches. If now the images of the two flames were allowed, by lessening the tension on the interni, to coalesce, and binocular vision again obtained, the letters and light became at once indistinct, showing that by lessening the tension on the interni we also lessened that of the ciliary muscle, so that the glasses could no longer be overcome. The same result followed if weaker glasses were employed, only the separation between the images was not so great.[1] The fact that the distance of separation of the images corresponded to the strength of the glasses used is very significant, and highly corroborative of the assertion that for every tension of the ciliary muscle there is a corresponding tension of the recti interni.

The explanation of the above phenomena is very simple. In order to overcome the concave glasses a certain amount of in-

[1] The various trials with the different glasses gave the following results: With — 1-16 the harmonious images were separated laterally twenty-three inches; with — 1-20, twelve inches; with — 1-30, three inches; with — 1-36, the flames overlapped each other. With any weaker glass actual diplopia did not exist, though with — 1-42, if a point of light was used instead of the flame, there was a perceptible widening of the point. The reason why there was no diplopia with very weak glasses was evidently because the tension on the ciliary muscle in overcoming the glasses, and consequently that on the interni, was so slight as not to be appreciable with the coarse test employed.

creased tension is required of the ciliary muscle. This latter contracts under nervous influence, and vision becomes distinct. If it be true, now, that all nervous action imparted to the ciliary muscle is also extended to the recti interni, then the nervous impulse which enabled the ciliary muscle to contract so as to overcome the concave glasses must extend itself to the interni, and an increased tension of these muscles would then be the result; and the equilibrium existing between the interni and externi, which was perfect before such increase took place, would necessarily be destroyed, and there would then be a preponderance of power in favor of the interni proportionate to the increase of tension in the ciliary muscle. If such a preponderance of muscular power did exist, it ought to show itself under the well known test of the colored glass and prism. We place the colored glass before one eye (both eyes being, of course, still armed with the concave glasses), and homonymous images are the result, proving beyond doubt the existing want of equilibrium.

But it may be objected to the above course of reasoning that, when the eyes simply look through the concave glasses, the tension on the ciliary muscle in order to overcome these, and consequently that extended to the interni, is just as great without as with the colored glass. If this is so, the equilibrium between the recti interni and externi, which was perfect before any attempt was made to overcome the glasses, would be lost the moment such attempt was made, and the eye would have the same tendency to turn in when the colored glass was *not* employed as when it was. This is true; the tension on the ciliary muscle and that communicated to the interni is just as great, and the tendency for the eye to turn in is also just as great, in the one case as in the other; but this tendency is resisted and overcome by a factor which is in full force when the eyes are looking through the concave glasses alone, but which ceases to exist the moment the colored glass is added. This new factor is the intuitive desire for binocular vision.

So long as the images on both retinas are equal in intensity, the desire for each eye to perform its share in the common act of vision is so great that every attempt to destroy this by a change in the direction of the optical axes is at once vigorously

opposed. As soon as the increased tension in the ciliary muscle (called forth in order to overcome the glasses) is extended to the interni, the change in the visual axes, which would be the natural result, is counterbalanced by the desire for binocular vision, which, in this case, can only be accomplished by the agency of the recti externi, the natural antagonists of the interni. Thus the equilibrium of the muscles, which would have been destroyed by the increased tension of the interni, on the one hand, is reinstated and maintained, on the other, by a corresponding increased tension of the externi.

But as soon as the image on one retina is reduced by placing the colored glass before one eye, the instigation toward binocular vision is removed; and as soon as the desire ceases the necessity for the muscular force, by means of which the desire was fulfilled, also ceases—or, more plainly, the externi cease to act. This destroys the equilibrium between the opposing muscles in favor of the interni, and homonymous images are the result. We have only to remove the colored glass, or, in other words, restore the power, and with the power the desire for binocular vision, and the homonymous images immediately coalesce; thus proving that when the eyes look through the concave glasses alone there is the same tension on the interni and the same tendency for the eye to turn in as when the colored glass is added, but that this tendency is counteracted solely by the desire for binocular vision.

Precisely the same result followed when the experiment was applied for the near as for the distance.

Hitherto we have occupied ourselves in establishing the fact that certain changes in innervation of the ciliary muscle were followed by corresponding changes in that of the interni. But in order to determine beyond doubt that these two muscular forces are mutually dependent upon each other we must, strictly speaking, demonstrate the other side of the proposition, viz., that variations in the tension of the interni are followed by corresponding changes in the condition of the ciliary muscle.

Experiment I.—I have the power of letting the right eye deviate from parallel axes sufficient to overcome a prism of 30°, with the angle outward. The eyes were, as in the previous experiment, armed with a concave 1-16, the strongest

glass through which vision remained distinct. If, now, the tension on the interni was relaxed so as to allow the right eye to deviate to its utmost, the type (20 in 20 feet) immediately became so indistinct that not a letter could be deciphered. Crossed images (as shown by the flames), separated about three feet, were the result. If these images were now made to approach each other by gradually increasing the tension on the interni, it was found that, though the vision improved *pari passu*, it was not till the primary and secondary images coalesced that the type became distinct. The strong glasses were now laid aside, and numerous trials made with weaker ones. It was ascertained that if the right eye was allowed to deviate to its utmost from the parallel, — 1-72 could not be overcome by the left, which still performed the act of vision. If, now, the tension on the right internus was increased, and the deviation thereby lessened, so that the secondary image was separated from the primary two feet instead of three, — 1-36 could be overcome. If the tension was further increased so that the images were only separated one foot, — 1-24 was overcome, by making the images coalesce, — 1-16 ; thus proving that different degrees of tension of the interni were followed by contemporaneous variations of tension in the ciliary muscle.[1]

[1] But it may be urged, in opposition to the foregoing arguments, that in hypermetropia, where the error in refraction is of such a degree as to require about the same amount of tension of the ciliary muscle as was used by the emmetropic eye in overcoming the concave glasses, and where, at the same time, there was no strabismus, the conditions are precisely the same as those in the experiment; and that, as there is increased tension on the ciliary muscle in order to make vision clear for the distance, there ought also to be increased action of the interni, which would then destroy the equilibrium of the external muscles so soon as the desire for binocular vision was removed, and this want of equilibrium would then show itself, just as it did in the experiment, by homonymous images; while, on the contrary, it often happens that the equilibrium of the external muscles of hypermetropic eyes shows itself to be perfect, even when such eyes are subjected to the test of the colored glass. But it must be borne in mind that the conditions, though apparently the same, are in fact by no means identical. *Non-squinting* hypermetropic eyes have, by long continued practice, become so accustomed to meet and successfully resist the tendency to turn in, under accommodative efforts for parallel rays, that an increased tension on the interni, counterbalanced by an increased tension on the externi, may be considered as the normal condition for such eyes for distant objects. In other words, though the tension of the

From the fact that the amount of accommodation increases with the degree of convergence, it has generally been consid-

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external muscles of the globe is greater, the equilibrium between them is as perfect as in emmetropic eyes. And we have no more right to expect that the colored glass will show a preponderance of muscular power in hypermetropia, where none exists, than we have a right to expect it in emmetropia, where there is perfect harmony between the muscles. Now, in order to make the conditions which obtain in such cases of hypermetropia parallel with those in the example, we must bring forth an amount of accommodation over and above what the hypermetropic eye has been in the habit of using with parallel axes—or, in other words, bring forth the amount of relative accommodation corresponding to this position of the optical axes. To do this we have only to employ the strongest concave glasses which such eyes are capable of overcoming with parallel axes, and yet maintain binocular vision.

The additional effort then made by the ciliary muscle to overcome the glasses ought to be followed by an increased tension on the interni. This would destroy the equilibrium in favor of these muscles, and the preponderance of muscular power, kept in abeyance by the desire for binocular vision, would show itself the moment this latter was removed or even lessened. This is the fact, for as soon as the colored glass is put up homonymous images follow.

That there is a strong tendency for all hypermetropic eyes to turn in is now so well established as to need no comment whatever. The reason why some do not is evidently because the equilibrium between the muscles is maintained by an increased exertion on the part of the recti externi.

When, however, from the error in refraction, the demand on the ciliary muscle, and, as a consequence, the tension on the interni, is so great that it can no longer be resisted by the externi, the want of equilibrium then shows itself by homonymous images without the accommodation being incited to increased action by concave glasses. This fact is well illustrated by the following cases.

Case I.—Miss A. H., æt. 18; patient has some of the symptoms of asthenopia from hypermetropia. Letters, however, only occasionally become indistinct, and the pain experienced is rather in the eyeball than over the brow; moreover, this pain is constant. Patient has given up all use of eyes, but finds no relief from rest. Manifest hypermetropia = 1-50 (vision was impaired by any stronger glass). Vision = 1 in both eyes; accommodation = 1-5. Ophthalmoscopic examination shows slight atrophic crescent around the optic nerve, which in each eye appears congested, as do also the retinal veins, there being a distinct venous pulse in each eye; otherwise the fundus appears perfectly normal.

There is no insufficiency of the interni, either for the far or near. On the contrary, there appears to be a weakness of the externi, as homonymous images are called forth by placing a colored glass over either eye without the help of a vertically displacing prism. At 20 feet distance these images are made to coalesce by a prism 7°, base outward. The images retain their distance of separation to whichever side the flame is moved. If the candle is

ered by modern ophthalmologists that the strabismus which occurs in hypermetropia is due to an independent action of

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gradually brought toward the eye the distance between the images gradually decreases till these combine at 24 inches. At 12 inches images produced by the prism and colored glass are exactly vertical, showing perfect equilibrium between the recti muscles. At 24 inches the images begin to grow homonymous, and the distance between them increases till, at 20 feet, they are separated "about 2 feet." Patient has never seen double, and can only do so with the red glass. As the patient could not, after a continued trial, relax her accommodation for more than a convex 1-50, and as the vision and total range of accommodation were so good, it was thought that idiopathic weakness of the recti externi must be the cause of the asthenopic troubles. As if in corroboration of this opinion, the examination of the muscles showed that the power of abduction at 15 inches was only equal to a prism of 5°. But thorough paralysis of the accommodation, with atropine, revealed total hypermetropia of 1-10.

Case II.—L. K., æt 19, suffers from asthenopia, the principal symptom of which is "blur," while engaged on close work. Patient has no pain in the eye or over the brow, but has suffered much from "general headache." There is no manifest hypermetropia; vis. = 2-3 + ; accommodation = 1-6. The patient sees homonymous images with the colored glass, without any displacing prism, separated at 20 feet, 18 inches.

These images combine when the candle is brought to a distance of four feet from the eye. A prism of 7°, base outward, reduces the diplopia for the distance.

At six inches, images produced by a prism, base upward or downward, are vertical; from this point out, homonymous. Patient has never seen double, and can only do so with the aid of the colored glass.

Thorough paralysis of the accommodation of both eyes shows total hypermetropia = 1-8. Through this glass the candle is seen distinctly, and the double homonymous images which were present before the accommodation was paralyzed have entirely disappeared, and the equilibrium of the muscles is perfect. After the effect of the atropine had passed off, + 1-18 was ordered, as this was the strongest glass which the patient would tolerate. Three weeks later the manifest hypermetropia had become 1-18. Through + 1-14 (the colored glass being placed over one eye), there was no diplopia; but if the spectacles were raised over the brow, while the colored glass still remained before one eye, double homoymous images followed at once, which immediately disappeared as soon as the glasses were lowered again.

Case III.—E. W., æt. 45, has all the symptoms of asthenopia from hypermetropia; hm. = 1-18; vis. = 1. Accommodation good. With the colored glass and no spectacles the patient sees homonymous images separated 10 inches. With + 1-18 the diplopia ceases, and a vertically displacing prism then gives vertical images. If the spectacles are raised, however, double images at once follow, and it requires a prism of 6°, base outward, to make them combine.

Case IV.—C. J., æt. 15. Hm. = 1-30; vis. = 1; A. = 1-5. Sees homonymous

the interni recti, for the direct and specific object of giving assistance to the ciliary muscle, and thereby increasing its power. I cannot help thinking that this view of the matter is wrong, and believing that *the initial step* in the strabismus following accommodative efforts in hypermetropia is solely due to the fact that the recti externi have not sufficient force to counterbalance the increased tension imparted to the interni by the same nervous impulse which enables the ciliary muscle to overcome the error in refraction, while, on the other hand, whenever the power of the externi is sufficient to successfully resist the increased action of the interni, while accommodative efforts are going on, there will then be no strabismus, however great the error in refraction may be. How else do we explain the fact that, of two persons, each of whom has the same amount of vision, the same degree of hypermetropia, and exactly the same range of accommodation, one will squint and

images separated, for the distance, eight inches. With + 1-30 double images disappear.

Case V.—A. P., æt. 10; has all the symptoms of asthenopia from hypermetropia. Hm. = 1-13; vis. = 1. Accommodation limited. Patient sees homonymous images, which only combine at 20 feet with a prism of 9°. With the glass which corrects the manifest hypermetropia (+ 1-13) the images approach each other very much, while without it they are widely separated. The accommodation was paralyzed, and the total hypermetropia found to equal 1-6½. Through + 1-6½ there was no diplopia.

From the above it would follow that not only are the demands on the ciliary muscle greater for the distance in hypermetropia than in emmetropia, but that there is also an amount of labor imposed on *both the interni and externi recti muscles*, in the case of non-squinting hypermetropic eyes, which does not exist at all in the normal organ; and, furthermore, that the amount of this increased taxation on the external muscles is proportionate to the error of refraction, always provided that the attempt is made to neutralize the hypermetropia by accommodative efforts.

But it may be suggested that, in the above cases, there might have been some idiopathic weakness in the externi, which would have then showed itself by homonymous images, by the test employed, independently of any accommodative efforts. That there was no such weakness, and that the homonymous images were solely due to accommodative efforts, is proved by the fact that the diplopia disappeared the moment the strain on the ciliary muscle was removed by atropine or convex glasses.

At the same time I would not wish to imply that weakness of the externi recti, analagous to that of the interni, might not ever occur, for I have myself seen cases of it. That such weakness would more frequently occur in hypermetropia can be readily understood.

the other not? As the range of accommodation and acuity of vision are the same in the two cases, the eyes of both must be equally strong; and as the error of refraction is the same, the same amount of strength must be expended by each in overcoming the anatomical deficiency, and yet there is strabismus in one case and not in the other.

It would appear also more rational that that peculiar form of strabismus known as intermitting, which only makes itself apparent in a condition of general debility, should be referred rather to *want* of power in the externi than to a direct increase of it in the interni. The occupation of the patient and the optical condition of the eye being the same in a state of temporary weakness as in a state of health, there will be the same motive and the same necessity for accurate accommodation in the one case as in the other; while, on the other hand, the desire for binocular vision decreases with the obstacles placed in its way, and as this was barely maintained by the exertions of the externi while in full vigor, and as, too, there is no absolute necessity for binocular vision, as there was for accurate accommodation, imperfect and perhaps painful vision with the two eyes is willingly discarded for distinct and easy vision with one.

Very much more might be said in relation to this interesting point, but it would be beyond the scope of the present remarks.

Hitherto parallel visual axes have been selected as a basis for the experiments used and the conclusions deduced from them, as in this position of the eyes the tension on the recti interni and ciliary muscles must be at the minimum.

The following experiments and accompanying remarks relate to the action of the recti and ciliary under a convergence of the optical axes.

Modern ophthalmologists have denied the old idea that the connection between convergence and accommodation is absolute, so that to every degree of the former there is a fixed amount of the latter. It is now considered settled beyond a doubt that a certain independence exists between these two muscular forces, and for the proof of this independence two assertions, alleged to be indisputable, are brought forward.

(1.) That the accommodation may be altered, and yet the convergence remain the same.

(2.) That the direction of the optical axes may be changed without modifying the accommodation.

As the whole idea and very existence of relative accommodation depends on the correctness of the above statements, we propose to examine them somewhat in detail.

The first question which naturally presents itself is, whether the assertion that the "accommodation can be modified while the convergence remains the same," is true.

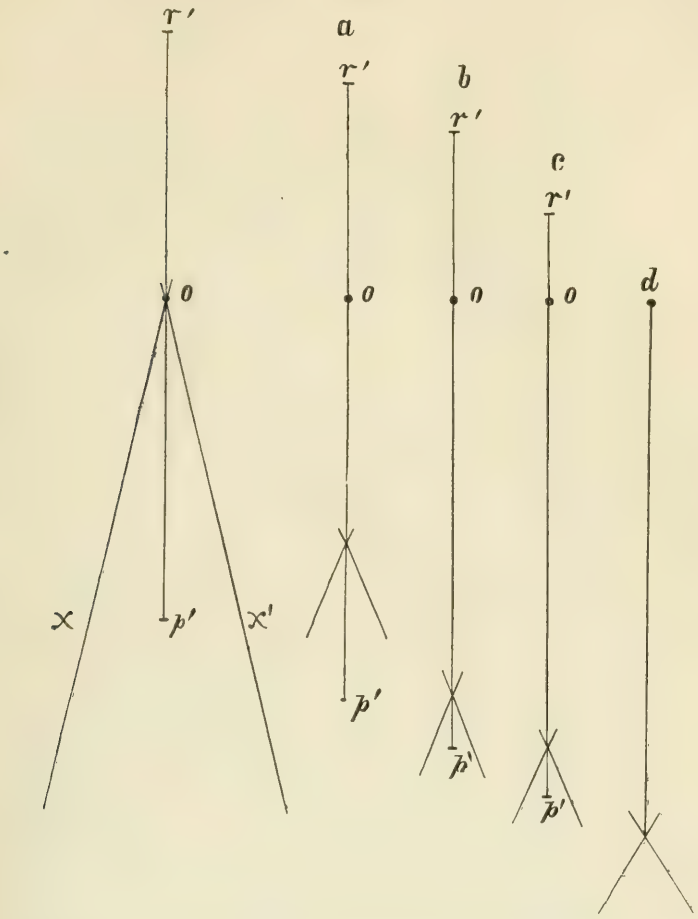
The best argument in its favor, and one which has been universally accepted as conclusive, is that contained in the experiments made by Donders with convex and concave glasses, by means of which he established the amount of accommodation for the different degrees of convergence, from parallel visual lines to a distance of about two inches from the eye. As the admirable diagram with which he illustrated his experiments is more elaborate than is necessary for the present purpose, the same principle has been applied to a single degree of convergence.

In this diagram, Fig. 1, the eyes are supposed to be converged upon an object at eighteen inches from the eye. The visual axes are represented by x and x'; the object viewed, consisting of small type, is situated at their point of intersection, and is denoted by o, which, as the accommodation is adjusted for that distance, is seen with distinctness. Now the strongest convex glass through which the object o still remains distinct, shows the amount to which the ciliary muscle can be relaxed at this definite degree of convergence, and is represented on the vertical line as extending from o to r'. This is known as the negative portion of the relative accommodation, and in this case is equal to a convex 1-20.

On the other hand, the strongest concave glass through which o still remains distinct shows the amount of accommodation which can be brought forth by increased tension or muscular effort, and is represented by the distance from o to p'. This is called the positive part, and in this case equaled a concave 1-14. The sum of the two, 1-14 + 1-20 = 1-8½, represents the amount of variation of which the accom-

modation is capable with a fixed and invariable degree of convergence.

Fig. 1.



From this it is plain that no doubt can exist about the actual variations in tension of the ciliary muscle under the influence of the glasses; the only question which can possibly arise is whether such modification is not accompanied by a change in the position of the visual lines. Here, too, it must be admitted as actually proved that there is no change in the optical axes, even when the ciliary muscle is compelled by the glasses

to pass from its maximum state of relaxation to that of its maximum tension.

So that we are compelled to accept as true the assertion that the accommodation "may be modified while the convergence remains the same."

This brings us to the second, and, as it were, correlative assertion brought forward in support of relative accommodation, viz., that the convergence can be altered and yet the accommodation remain unmodified. Here, too, the best proof of this statement is that furnished by the simple experiments made by Donders with prisms, by the use of which, to use his own words, "we easily convince ourselves that an object can be accurately seen with both eyes at the same distance, and that consequently the convergence may be altered without modifying the accommodation."[1]

There can be no doubt whatever in regard to the truth of the statement that an object can be distinctly seen with both eyes at the same distance, through prisms of various strengths, whether the angles be turned inward or outward, and consequently under different degrees of convergence. But does the fact that the object *can* be so seen prove that the convergence may be altered without *modifying* the accommodation? We think not, and it is to prove that this last statement is incorrect that the following experiments were made.

Precisely the same conditions as those represented in Fig. 1 were taken. Here it will be remembered that the strongest convex glass through which o remained distinct was $+1.20$, and its value was represented on the vertical line as extending from o to r'. On the other hand, the strongest concave glass was -1.14, and was represented as extending from o to p'. If now, as Donders affirms, the convergence may be, to a certain extent, altered without modifying the accommodation, then we may change the direction of the visual axes and yet the object will still be distinctly seen through the same glasses, both convex and concave, as these are in fact but the representations of the accommodation. In other words, we may alter the direction of x and x', and yet the points r' and p' will remain the

[1] Accommodation and Refraction of the Eye, p. 111.

same. We change x and x' by placing a prism of say 5° angle inward before each eye, which increases the convergence from eighteen inches to about twelve, while the object still remains perfectly distinct. If, now, we have not modified the accommodation, we ought, on the one hand, to be able to allow it to relax for + 1-20, and, on the other hand, to be able to overcome a concave 1-14. But we find on trial that the object appears indistinct through + 1-20, the strongest glass for which the accommodation can be relaxed being + 1-24. While, on the other hand, we find that we can not only overcome a — 1-14½, but even a — 1-12. So that the amount of relative accommodation with the prisms is equal to nearly 1-7, instead of, as in the former case, 1-8½.

The various changes which have followed the alteration of the convergence by the prisms are presented in figure 1, diagram *a*. The optical axes x and x' intersect each other nearer the eye—r' the relative far point, and p' the relative near point, descending on the vertical line, have approached the eye, while *o*, being a fixed object, has remained stationary; and it will be seen that *o*, instead of lying at the point of intersection of the optical axes, and just at the line of division between the positive and negative parts of the relative accommodation, now lies in the upper half of the negative. By increasing the convergence we have not only displaced the relative accommodation, but also increased it, while at the same time we have changed the proportion between the positive and negative, so that the latter predominated over the former, which is just the reverse of what it was before the convergence was increased. All these changes in the conditions of the relative accommodation are exactly similar in kind, and very nearly identical in degree, with those which would have followed had the eyes been converged to 12 inches naturally, instead of by means of prisms.

If now, instead of prisms, the united angles of which amount to 10°, we use those which amount to 20°, we see exactly the same changes taking place, differing only in degree, figure 1, diagram *b*. Here + 1-30 is the strongest convex glass through which the object remains distinct, while on the other hand

— 1-11 can be overcome, making the entire relative accommodation equal to 1-7.

In diagram *c*, where the united angles of the prisms equal 25°, the convex glass is 1-50 and the concave —1-9½, the entire relative A. being =1-8.

In diagram *d*, where the united angles of the prisms equal 30°, the accommodation could not be relaxed, even for so weak a glass as +1-80, as was shown by the fact that vision was made indistinct by it.

It will be seen that the positive part of the relative accommodation has become successively smaller through the series of diagrams from *a* to *d*, in which it has no existence at all, the relative A. being consequently all negative. And it will be observed, too, that whereas the object *o* in Fig. 1, *a*, lay at the very beginning of the negative portion, in *d* it lies at its furthest extremity.

If now, instead of increasing the convergence by turning the angle of the prisms inward, we lessen it by placing the angle outward, a result identical in kind follows, only the optical axes intersect further from the eye, and the relative accommodation is likewise removed and the proportions between its negative and positive portions modified.

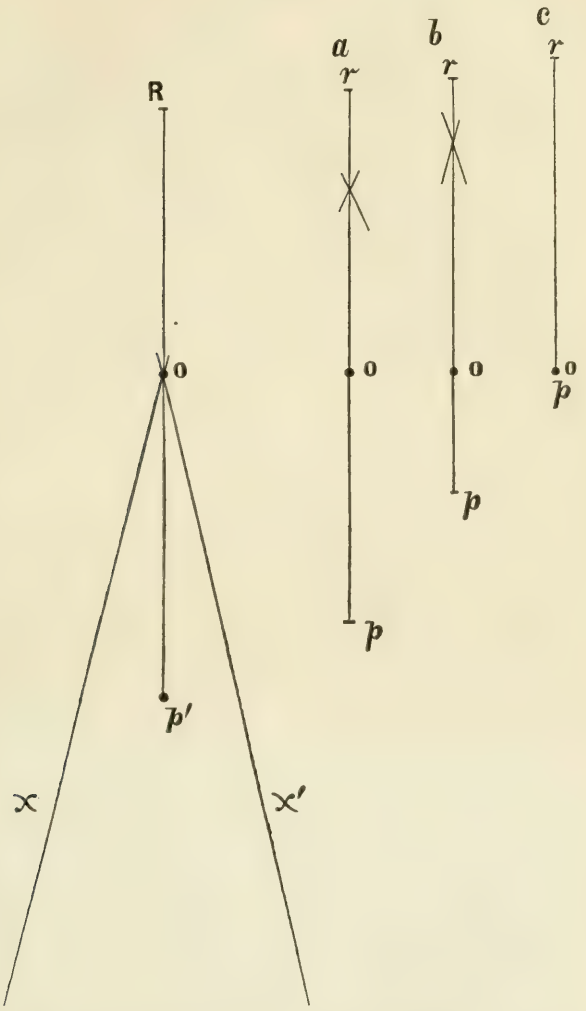
Fig. 2 represents the various changes produced by the prisms, the angles being here placed outward. Weaker prisms are employed in this case, as the optical axes are rendered parallel by prisms the united angles of which amount to 15°. Consequently those were used whose united angles amounted to 5°, 10° and 15°, instead of, as in the former case, 10°, 20°, 30°.

It will be seen that just as *o* was in Fig. 1 always within the negative portion of the relative accommodation, so here (Fig. 2, *a*, *b*, *c*) it is always within the positive; and just as *r'* in Fig. 1 with increased convergence gradually descends to *o*, so in Fig. 2, *p'* under diminished convergence ascends to *o*.

Now it is very true that the object has been distinctly seen at the same distance with all these different degrees of convergence; but this does not prove that the accommodation has not been modified, for with every alteration in the convergence there has been a palpable and computable modification of the

accommodation equaling in the aggregate a convex glass of $1\text{-}8\frac{1}{2}$.

Fig. 2.



The reason why the object *o* remains distinct while the convergence is changed by the prisms is, then, not because the accommodation has not been modified, but because the object remains within the limits of such modification, or, in other

words, within the *region* of the relative accommodation, notwithstanding the alteration in convergence.

From Fig. 1 it becomes evident that the convergence may be increased at pleasure, and yet the object will be distinctly seen so long as it remains in the region represented by the negative portion of the relative accommodation, that is, till r' descends to o; while, on the other hand, Fig. 2 shows that the convergence may be diminished till p' ascends to o. When, however, in either case, o remains outside of the limits of the relative A., it at once becomes indistinct.

From the above experiments it would appear to have been satisfactorily demonstrated that the statements made by Donders in regard to relative accommodation are in part correct, and in part incorrect; for it is true, as Donders asserts, on the one hand, that without change of convergence the accommodation may be modified, but it is not true, on the other hand, that the convergence may be altered without modifying the accommodation.

It certainly seems strange and even contradictory, at first sight, that the action of the ciliary muscle, even when excited to a considerable degree, should not affect the convergence, while even a slight change in the optical axes does affect the ciliary muscle. But it must be borne in mind that the conditions in the two cases are very different. The intimate connection between the action of the ciliary muscle and the recti interni has been shown in the preceding remarks, and formulated in the proposition that to every increased action of the ciliary muscle there is a corresponding increased tension on the interni; and it was fully explained that the only reason why the convergence remained unaltered, while the ciliary muscle was incited to increased tension by means of concave glasses, was because the increased tension imparted to the interni, which would turn the eyes, was counterbalanced by the antagonistic muscular contraction of the externi, incited by the intuitive desire for binocular vision—the result of which is that the ciliary muscle has a certain freedom of play, or range of action, independent of any change in the optical axes. But, on the other hand, the ciliary muscle, having no antagonist, and there being no intuitive desire to call forth the ac-

tion of such antagonist, did it exist, naturally assumes, with the different variations in the optical axes under the action of the prisms, that amount of tension which it has been accustomed to associate with a given degree of convergence, so that when this latter is changed, even in a trifling degree, a corresponding change takes place in the tension of the ciliary muscle, altering at once the amount and character of the relative A.

In conclusion, it would appear to have been satisfactorily proved (1) that in emmetropia with parallel axes, where there is the least action of the ciliary muscle there is also the minimum amount of tension on the interni; (2) for every increased action of the ciliary muscle there is a corresponding tension on the interni, and *vice versa*, and that this increase, as far as relative accommodation is concerned, is counterbalanced by an opposing muscular force in the recti externi which maintains the direction of the visual axes.

From which it would appear to follow that the old idea that a definite convergence is necessarily attended with a definite accommodation, is, *physiologically* speaking, the more correct one, since relative accommodation is only the result of an artificial stimulus to which the natural eye is never subjected, and further is not, as has been asserted, the expression of the force of the ciliary muscle alone, but of a set of muscles, consisting of the ciliary, recti interni and externi muscles.

The above remarks, of course, are intended to apply to normal emmetropic eyes only.

It remains to be added, in this connection, that the belief, which has now existed for some time, that the two ciliary muscles of a pair of normal eyes cannot act independently of each other, has been rather strengthened than refuted by more modern observers (Graefe,[1] Donders,[2] Hering[3]).

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[1] Archiv f. Ophthal., B. viii., Ab. ii., p.331, 1862: "Es widersteht bis jetzt unseren Anschaungen eine differenz der Accommodativen Kraftverwendung beiderseits zu statuiren." Graefe, 1862.

[2] Zehender, Klinische Monatsblätter, June, 1866, p. 173. Das binoculäre sehen Donders: "Selbst ein klein Refractionsunterschied kann durch die Accommodation, wenn sie auf beiden Augen gleiche Breite hat, nicht ausgeglichen werden, *so sehr ist die Einrichtung des einen Auges an die des anderen gebunden.*"

[3] Die Lehre vom Binoc. sehen Hering, 1868, p. 136.

These experiments go to prove that the accommodation cannot be varied in one eye without being varied in the same degree in the other. This holds good as well for the associated movements of the eye as for direct convergence of the visual axes, for the reason that the *sum* of nervous force, expended by the interni during the associated movements, where one internus is elongated and the other forcibly contracted, is as great as it is when in direct convergence each muscle is equally contracted.

These principles, advanced by the earlier writers, have been lately discussed in their fullest detail and beautifully illustrated by Prof. Hering, with what appears a claim for originality. We cannot, however, see any important distinction between saying, as has been done repeatedly, that the two ciliary muscles cannot act independently, and saying that the two eyes, as far as the action of the ciliary muscle is concerned, must be looked upon as a "single eye" (p. 136).

The statement, "Es besteht also kein Zusammenhang zwischen des inneren geraden eines Auges und seiner Accommodation, wohl aber zwischen der Innervation der Adductorengruppe und der Innervation des accommodation Muskeln des Doppelauges," amounts to saying, simply, that the accommodation can take place under the associated action of the muscles of the globe, and that the amount of the accommodation is always the same in both eyes.

Suture of the Wound of Cornea after Flap Extraction —Report of Forty-four Cases. By Henry W. Williams, M.D., of Boston. (1868.)

One year since I asked the attention of the Society to a modification of the operation of extraction of cataract, by the insertion of a suture to bring together the edges of the corneal wound.

To-day I offer statistics of forty-four operations, being all the cases in which I have practiced this method since our last meeting.

Four of these cases remain under treatment, a sufficient time not having elapsed since the operation to allow of the deter-

mination of the amount of vision by a trial of glasses; but in all these a good result appears to be already secured, as the corneal wounds have united without accident, and the pupils seem to be clear.

Thirty-two cases have been completely successful, the patients being able to read ordinary print.

Four cases are partially successful—slight obstructions of the field of the pupil preventing perfect vision; but in all of these complete success will doubtless be obtained by slight secondary operations.

In two of the remaining four cases of failure a most unfavorable prognosis was given previous to the operation, on account of irido-choroiditis from which the patient had suffered, and for which he had undergone iridectomy. In one of the other cases the patient insisted on going home a few days after the operation, returning, some time after, with occlusion of the pupil and obliteration of the anterior chamber by the displaced iris, though the corneal wound had united well and this structure continued clear. In the other case the cornea assumed a sloughy look on the second day—perhaps, I feared, on account of dampness of the room occupied by the patient.

In no case have any unfavorable symptoms, beyond, in some cases, a slight irritation, arisen, which could possibly be ascribed to the suture; and it has seemed to me that the healing of the wound has been accelerated and hernia of the iris prevented by its use, thus securing obvious and important advantages and shortening the *critical* period, as well as abridging the whole term of treatment.

The results of the operations given in the following table were as follows:

Perfect success	80 per cent.
Partial success	10 "
Failure	10 "

OPERATIONS FOR CATARACT.

STATISTICS of Forty-Four Cases in which the Corneal Wound was united by Suture after Extraction, from June, 1866, to June, 1867.

No.	AGE.	SEX.	SIDE.		Anæsthetics.			REMOVAL OF SUTURE.	Caps. Cat.	RESULT.			TREATMENT.
			Right.	Left.	Ether.	Lower Section.	Upper Section.			Read ord. type.	Go alone.	Failure.	
1	60	F.	....	1	1	....	1	Suture removed 14th day	....	1	....	....	
2	77	"	1	....	1	....	1	" " 9th "	....	1	....	....	20 days' treatment.
3	"	"	....	1	1	....	1	" " " "	....	1	....	....	" " "
4	63	"	1	....	1	....	1	" " 7th "	....	1	....	....	14 " "
5	"	"	....	1	1	....	1	" " " "	....	1	....	....	" " "
6	57	M.	1	....	1	....	1	" " " "	....	1	....	....	30 " "
7	"	"	....	1	1	....	1	" " " "	1	1	....	....	Reads only after a secondary operation for division of capsule.
8	47	F.	....	1	1	....	1	" " 6th "	....	1	....	....	16 days' treatment.
9	67	"	1	....	1	....	1	" " 10th "	....	1	....	....	26 " "
10	68	"	1	....	1	....	1		....	1	....	....	
11	"	"	....	1	1	....	1		....	....	1	....	
12	70	M.	1	....	1	..	1		....	1	....	....	10 days' treatment.
13	73	"	1	....	1	....	1	Suture removed 9th day	....	1	....	....	21 " "
14	"	"	....	1	1	....	1	" " 10th "	....	1	....	....	" " "
15	64	"	....	1	1	....	1	" " 15th "	....	....	....	1	Unfavorable prognosis given before operation.
16	"	"	1	....	1	....	1	" " " "	....	....	....	1	Unfavorable prognosis given before operation.
17	38	"	....	1	1	1	....		....	1	....	....	27 days' treatment.
18	66	F.	....	1	1	1	....	Suture removed 35th day	....	1	....	....	Reads only after second operation to remove obstructions from the pupil.
19	65	"	....	1	1	1	....	" " 16th "	....	....	....	1	Patient was most unmanageable, and insisted on leaving the Hospital before it was deemed safe, though all was *then* going on well

20	67	M.	1	....	1	1	....	Suture removed 14th day	....	1	....	....	21 days' treatment.
21	"	"	....	1	1	1	....	" " " "	1	....	1	..	L. pupil obstructed by capsule, to be lacerated at a future time.
22	57	"	1	....	1	1	....	" " 12th "	....	1	....	....	17 days' treatment.
23	"	"	....	1	1	1	....	" " " "	....	1	....	....	" " "
24	65	"	....	1	1	1	....		....	1	....	..	
25	57	F.	1	....	1	1	....	Suture removed 7th day	....	1	....	..	
26	"	"	....	1	1	1	....	" " " "	....	1	....	....	
27	70	"	....	1	1	1	....		....	1	....	....	
28	65	"	1	....	1	1	....		....	1	....	.	
29	77	M.	1	....	1	1	....		....	1	....	....	
30	"	"	....	1	1	1	....		1	....	1	....	Pupil slightly vailed by capsule; to be removed in future.
31	76	"	1	....	1	1	....	Suture removed 10th day	....	1	....	....	
32	"	"	....	1	1	1	....	" " " "	....	1	....	....	
33	68	F.	....	1	1	1	....		1	....	1	....	Pupil slightly adherent to corneal cicatrix, on account of ungovernable restlessness of patient, and is partly closed by capsule, which could be readily lacerated.
34	40	"	1	....	1	1	....		....	....	....	1	Sloughing of cornea on 3d day, perhaps from dampness of room
35	"	"	....	1	1	1	....		....	....	....	....	Under treatment. Lett eye doing well when she left. Returned for glasses
36	45	M.	1	....	1	1	....		....	1	....	....	
37	"	"	....	1	1	1	....		....	1	....	....	
38	66	"	1	....	1	1	....	Suture removed 7th day	....	1	....	....	
39	"	"	....	1	1	1	....	" " " "	....	1	....	....	
40	45	"	1	....	1	1	....	" " 5th "	....	1	....	....	Returned to New York on 24th, ten days after operation. Already able to read.
41	60	"	....	1	1	1	....	" " 7th "	....	1	....	....	15 days' treatment.
42	62	"	1	....	1	1	....	" " " "	....	....	....	....	Under treatment Wounds healed. Pupils clear.
43	"	"	....	1	1	1	....	" " " "	....	....	....	....	Under treatment. Wounds cleared. Pupils clear.
44	65	F.	1	....	1	1	....	" " " "	....	....	....	....	Under treatment. Doing well in all respects
									4	32	4	4	

A Cystitome for the Modified Linear Extraction. By Dr. G. Hay, of Boston. (1868.)

In view of the value of the modified linear extraction, I desire to propose a form of cystitome which, it is hoped, will facilitate the performance of the operation. The shape proposed is such as would be obtained by first lengthening to the extent of four lines the stem of the ordinary straight instrument, and then by bending the lengthened stem at right angles to itself, at a point four lines distant from its toothed extremity, and as if, in the bending, this extremity were moved in a direction the opposite of that in which the tooth projects.

Owing to the position of the incision, which intersects the outer convex surface of the sclerotic in a line about the length of the diameter of the cornea, and which lies symmetrically above the cornea, each of its extremities being only a short distance—from two-thirds of a line to a line—below the level of the top of the cornea, it is difficult and dangerous to introduce the ordinary straight instrument. If the cornea is not drawn down far, the lens is in danger of being dislocated by the instrument, the eyebrow preventing the handle from being sufficiently depressed to keep the point far enough forward toward the cornea. If, on the other hand, the cornea is sufficiently drawn down, then the strain on the eye may cause rupture of the zonula, with escape of vitreous, certainly a very unfavorable complication. The instrument used by Graefe is differently shaped, we have been informed, according as the right or left eye is to be operated on. The modification here proposed is simpler, one instrument serving for both eyes. It can be easily and safely manipulated, allowing the division of the capsule without drawing the cornea down as far as is required in using the straight instrument.

Inclination of the Vertical Meridian of the Eyeball for the Direction of Vision upward and outward. By Dr. G. Hay, of Boston. (1868.)

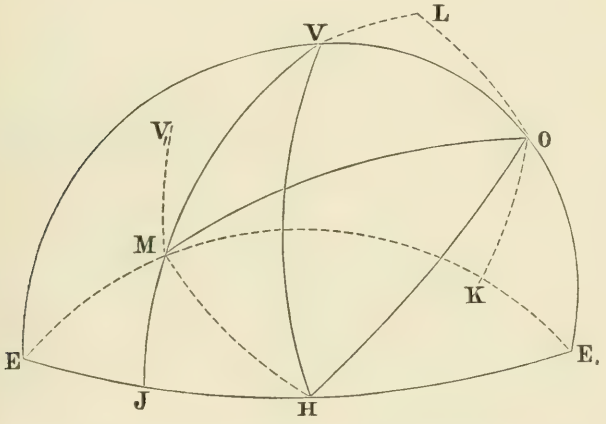
With regard to this inclination we find the two following statements: first, one by Alfred Graefe,[1] as follows: "In look-

[1] Motilitätsstörungen des Auges, p. 11. Berlin, 1858.

ing diagonally upward and outward the vertical meridian, according to the investigations of Donders, is inclined (at its upper part) outward." The expression "at its upper part" is not in the original, but is here inserted as giving its meaning.

Again, supposing the object to be distant, and to be looked at by both eyes at once—and understanding by *line of vision* a straight line from the centre of rotation of the eye to the object, and by *plane of vision* the plane passing through the lines of vision of the two eyes, that is, through a straight line connecting the centres of the two eyes and through the object —Helmholz[1] says: "With the plane of vision raised and the line of vision turned *to the right*, there occurs rotation of the eye (about its line of vision) *to the left*," etc.

These two statements seem at first at variance; it is here proposed to show by a diagram that they are consistent with each other.



The lines of the figure represent arcs of great circles of the right eye. The eye may be supposed to be looking, with the head erect, horizontally and directly forward (toward the reader).

Let H be the intersection of the line of vision with the cornea—that is, nearly, the middle of the cornea.

Let H be a pole of the great circle E V E,, so that

$$H E = H E_{,} = H V = 90°.$$

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[1] Physiologische Optik, p. 463.

If we take V to be the middle of the semicircular arc E V E_1, then

$$V E = V E_1 = 90° = V H,$$

and V is a pole of great circle E H E_1.

If, now, the plane of E H E_1 is horizontal, the plane of the arc H V is vertical, and H V will be *the vertical meridian;* that is, a vertical meridian, passing through the middle of the cornea, for the particular position of the eye above indicated.

Take V O = 45°. Let O be a pole of great circle H M.

Suppose the eye to be turned up and out so that the middle of the cornea H comes to the position M. According to Listing's law, the vertical meridian V H will then have the position which it would have if the proposed change of place were caused by a rotation of the eye about the diameter through O.

By such rotation O H would come to O M, H would fall on M, and H V would take the position M V_1, if we assume the angle V_1 M O equal to V H O. To facilitate the conception of this change of position, suppose just outside the eyeball duplicate stationary arcs E V E_1, E H E_1, and V J.

To show that the statement quoted above from Alfred Graefe holds good in the example before us, it is only necessary to show that angle V H O is greater than V M O; for, if so, then the upper part of the vertical meridian is, in the case of looking up and out, inclined outward; that is, outward from the vertical plane V J passing through the new line of vision, the line from M to the centre of the eye. This is easily shown.

Continue M V to L, so that M L = 90°. Then (since M O is also equal to 90°) V L O is a spherical triangle, right-angled at L. V L and V O are each less than 90°, and consequently L O is less than 90°. Angle L V O, equal to E V J, is less than 90°. According to the principle that of two sides that is greater which is opposite the greater angle, we then have

$$L O < V O,$$

or angle L M O < V H O.

The statement quoted from Helmholz will also hold good in our present case, if it can be shown that the angle V_1 M $E_1 < 90°$; for then, while in the first position, with the middle of the cornea at H, V H was perpendicular to the then plane of vision E H E_1, we have in the second position, with the middle of the cornea at M, V_1 M inclined to the left (the reader's right), as compared with a perpendicular at M to the present plane of vision E M F_1.

This also is easily shown. We have already $V_{,} M O = V H O$; angle $V H O$ is measured by $V O$. It remains only to show that $O M E_{,}$ is measured by an arc less than $O F_{,}$.

Take $M K = 90°$; then triangle $O K E_{,}$ is right-angled at K.

$K E_{,} < 90°$; $O E_{,} < 90°$; then $O K < 90°$; angle $O E_{,} K < 90°$.

Then $O K < O E_{,}$. $O K$ measures angle $O M K$ $(= O M E_{,})$; then $V_{,} M E_{,} (= V_{,} M O + O M K = V H O + O M K)$ is measured by an arc less than $V E_{,}$ $(= 90°)$.

An experiment confirmatory of the above may be made by sitting opposite a picture with rectangular frame of dark color and hung rather low against a light-colored wall. If we look steadily for a few moments at the lower right-hand corner of the picture, and then direct the eyes upward and to the right to a point of the same wall, and keep them fixed till the spectrum appears, it will be found that it presents two portions, one nearly vertical, with its upper end more to the right; the other nearly horizontal, with its left end lower.

The retinal images in these circumstances would be formed at and near the macula lutea, on the lines in which the horizontal and vertical meridian planes intersect the retina. The corresponding spectra for any direction of the line of vision may, when mentally projected outward, be approximatively considered to lie in these planes (neglecting any change in apparent position which may be due to the binocular union of the two pictures), and if projected upon a wall would appear at the lines of intersection of these same planes with the wall. The angle of these lines of intersection would be different for different positions of the wall. Also, for a given position of the wall, the angle would vary with the degree of rotation of the meridian planes around the line of vision, except if the wall were perpendicular to the new line of vision, in which case the spectral lines would always be at right angles.

In the particular experiment referred to, we suppose the right eye, represented by the figure, to be opposite to a vertical wall, and the latter to be parallel to the straight line (supposed horizontal) connecting the centres of the two eyes; then the plane of vision at any elevation will intersect the wall in a horizontal line. If we also suppose, in the figure, the diam-

eter through V to be vertical, then the meridian planes V J, V H, etc., will intersect the wall in vertical lines.

Thus it is apparent why, if the eye, with the middle of the cornea at H, looks at the dark vertical line on the wall and directly in front (the diameter through H being supposed perpendicular to the wall), the retinal impression thereby caused will give rise, by continuing after the eye has assumed a new position (with the middle of the cornea at M), to a spectrum on the wall, the upper end of which is inclined outward; also it is apparent that the impression caused under the same circumstances by the horizontal dark line will give rise to a spectrum on the wall, the outer end of which is inclined upward (the angle V, M E, being less than 90°, and the plane of E M E, intersecting the wall in a horizontal line).

A Point in the Physiology of Vision. By Dr. B. Joy Jeffries, of Boston. (1868.)

Last May a communication which I made to the Boston Society of Natural History led the President, Prof. Jeffries Wyman, to record an observation which, I believe, is new in physiological optics. At least I have not found it stated in Helmholz, Fick, Cornelius, Scheffler, Aubert, Ludwig, Funke, Nagel, Lewndean, Hering, Classen, Schleiden, Ruete, Wundt, Meissner, and other writers touching on retinal after-pictures, or the theory of projection.[1] The fact is this: when we look at a circle or ring on a surface at right angles to our line of vision, and after gazing steadily long enough to have an after-impression on the retina, turn our eyes toward another surface, cutting our visual line at an angle, then the projected after-picture of the circle or ring will not have this figure, but appear as an ellipse of greater or less curve, according to the

[1] Boston, *January* 29, 1869.

Dear Dr. Noyes:—In my article before the American Ophthalmological Society on *after-impressions*, if I have mentioned Volkmann as one whom I examined and found nothing touching the experiments given by Prof. Jeffries Wyman, I am wrong, as I now find in a pamphlet of his mention of these. Dr. Hay's results and mine, however, Volkmann does not give.

In haste, yours truly,

B. Joy Jeffries.

angle at which this surface we project on cuts our visual line. A square thus appears as a lozenge, etc.

The solution of this appearance is simple when we remember that the projected picture is in reality a right-angled cone, whose apex is at the nodal point (taking the anterior and posterior as together), and whose base is the surface we project on. The ellipse or the lozenge are, therefore, only conic sections, as readily illustrated by diagram.

In continuing this experimentation with rings and circles, white, black and colored, the latter, in order to have the after-picture of the complementary color and so more striking, I was surprised to find how much depended on what we might call the mentality of the eye. A certain degree of excited sensibility of the retina, so favorable to all after-pictures, assisted the experiments. I found also, as Helmholz has said, that movement of the body, head or eye rendered the after-impressions less strong. The degree of distinctness of the projected picture I found depended in some measure upon the degree of mental intentness. This, to me, was very striking. I thought at first it might be owing to movement of the eyes whilst gazing at the object to obtain a retinal impression, thereby diffusing the picture over a larger retinal surface, and rendering the consequent after-picture less sharply defined. I insured fixation and accommodation by having the object within eight or ten feet, and a central cross to gaze at.

The mentality of the act of projection seems strikingly shown by this fact. When I looked for the elliptical after-picture of a circle projected on a plane at angle to the visual line, I could see it as such, but I could, *at will*, also see it as a circle, the outer edge furthest from the original picture seeming to touch the surface, and the rest of the circle standing out free. This does not accord with the experience of my colleague, Dr. Hay, to whom I mentioned this experimentation, or that of Prof. Wyman, who, upon trying, said he saw at will, as Dr. Hay, the circle in after-picture as a *circle*, but projected through the surface at an angle, on which, without mental effort, the circle seemed to lie as an ellipse, or the square as a lozenge. This seems to me to correspond to the power we may readily acquire of using either eye with its fellow open, as, for instance,

with the monocular microscope or ophthalmoscope, when we can at will mentally suppress the picture on either retina, and perceive the other. Mr. J. Z. Laurence, of London, has proposed to obtain a correct outline of the field of vision by means of the complementary colored field, after gazing steadily for some time at the primary color. This he has successfully done, as also, quite recently, Dr. Giraud-Teulon, of Paris. No matter how apparently simple various experiments in physiological vision may at the time observed seem, they often lead to very important results.

On a New Series of Test-Letters for Determining the Acuteness of Vision. By John Green, M.D., of St. Louis, Missouri. (1868.)

The letterprœven of Snellen (Utrecht, 1868) are deservedly the acknowledged standard for determining the acuteness of vision.[1] They are, however, somewhat imperfect both in plan and in the execution of the smaller letters. The defects in plan consist in the selection of letters which are not so uniform in size and character as is to be desired, and still more in the fact that the gradations of size in the consecutive numbers of the series are not uniform. Thus the successive numbers CC., C., LXX., L., XL., XXX., and XX. of Snellen give the very unequal series of ratios, 1-2, 7-10, 5-7, 4-5, 3-4 and 2-3.[2]

In a communication made to this Society at the meeting of 1867 I exhibited a series of test-letters, of sixteen gradations of size, in which a constant ratio of 7-10, or, more exactly, .7069, was adopted. This series included all the higher and lower numbers of Snellen, but differed from that standard in

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[1] The mere statement of the size of type read, as diamond, pica, etc., or the designation of the size by a number, according to Jaeger, is of very little utility compared with the accurate determinations first obtained by Snellen. The Échelle Régulièrement Progressive of Giraud Teulon is but a poor imitation of Snellen's test-types, and can claim no superiority as regards regularity of progression.

[2] In the series of Giraud-Teulon, which is the only other making any pretensions to regularity, the corresponding ratios are 1-2, 3-4, 2-3, 4-5, 3-4, and 2-3; in Jaeger's Schrift-Scalen the numbering is altogether arbitrary and irregular.

the middle of the scale, for which reason the proposed change could not be very warmly advocated, notwithstanding the evident correctness of the principle on which it was based. I have now to propose a new series of twenty-four numbers, bearing the constant ratio of .795, and combining the advantage of regular geometric progression with the preservation of all the important numbers of Snellen.

The following table shows this new series side by side with those of Snellen and Giraud-Teulon. The common ratio is found by the formula $x = \sqrt[3]{.5} = .795$ nearly.

Exact Series, ratio .795.	Approximate Series	Series of Snellen.	Series of Giraud-Teulon.
200.	200.	200.	200.
159.	160.		
126.4	126.		
100.	100.	100.	100.
79.5	80.	70.	75.
63.2	64.		
50.	50.	50.	50.
39.7	40.	40.	40.
31.5	32.	30.	30.
25.	25.		
19.8+	20.	20.	20.
15.75	16.	15.	15.
12.5	12.5	12.	
9.9+	10.	10.	10.
7.87	8.	8.	
6.25	6.25	7.	7.5
		6.	
4.96+	5.	5.	5.
3.93+	4.	4.	4.
3.125	3.125	3.	3.
2.48+	2.5		
1.96+	2.	2.	2.
1.56	1.56		
1.24	1.25		
.98+	1.	1.	1.

In the selection of letters for tests of vision it is important to choose those which are most nearly uniform in size and character, and which are, at the same time, as little complex as may be in their formation. It is impossible, however, to invent even a small series of letters which shall be strictly equal in size and uniform in design; and experience shows that any series, however limited, may be divided into letters of easier and of more difficult recognition. Letters made up wholly or in part of oblique lines, and also letters in which the horizon-

tal elements greatly predominate, are very unequally affected by different forms of astigmatism, and may therefore be advantageously rejected. Rejecting for these reasons the letters A B K M N R S V W X Y Z, there remain fourteen to which these objections do not apply, viz., C D E F G H I J L O P Q T U. Of these, the letters C G O Q, which are modifications of the circle, are smaller than the square letters of corresponding height and width, and, as a fact, we observe that they are less easily recognized. The letters C and G, F and P, D and O, also, are less easily distinguished from each other than from most of the other letters. These minimum deviations from strict uniformity are, however, of no special disadvantage, for they afford us a convenient means of drawing somewhat wider distinctions than if the letters were absolutely uniform. Thus we designate any degree of vision by the size of letters positively and accurately named; but if only the easier letters of the line are distinguished with certainty, we note the number with the addition of the minus sign; or if only one or two of the very easiest are made out, we note it by the next lower number with the addition of the plus sign.

The form of letter adopted is that known to printers as Gothic, and each letter is drawn, as nearly as good proportion will admit, within a square; they are, on the whole, much simpler in construction and more nearly equal than any before published.

The arrangement of the whole series upon a single sheet is a matter of very considerable convenience, especially when the tests have to be used in a room less than twenty feet in length. This is easily and satisfactorily accomplished by making the spaces between the adjacent lines proportionate to the height of the letters.

In connection with these test-letters a sheet of astigmatic tests is proposed, in order to afford a ready means of examining every case of defective vision for astigmatism. These tests consist of short lines, or sets of parallel lines, of various degrees of inclination, and corresponding in direction to twenty-four or thirty-six equidistant radii of a circle. These lines are arranged in linear series, and are printed both in black ink on a white ground and in white on a black ground. By in-

clining the card on which they are printed any desired degree of inclination may be given to the lines, as in the circular test-diagrams already described by me for the detection and measurement of astigmatism. Although less complete than the other apparatus, this sheet of test-lines, used in connection with the test-letters, will be found a useful addition to our means for investigating astigmatism.[1]

Retinitis in Glycosuria. By Henry D. Noyes, M.D., of New York. (1868.)

I am aware that disease of the retina has been found complicating diabetes mellitus, but cases of this kind are by no means common, and I therefore submit the following notes. In Mauthner, Lehrbuch der Ophthalmoscopie, 1868, p. 375, it is said: "Edward Jaeger found retinitis in an individual who suffered from *diabetes mellitus*. A connection between diabetes and retinitis has since that time by some (Virchow, Freytag, Nagel) been declared to be possible, and by others (Martin, Galezowski) been positively asserted. Notwithstanding pains have been taken to designate the peculiar characteristics of this retinitis, we must await further investigations to arrive at any certainty."

Jaeger's case is in his Beiträge zur Pathologie des Auges, p. 33, und Tafel, xii.

The history of the patient's general ailment is, that he was twenty-two years old, in good health until within four years, and then became feeble; had occasional febrile attacks, with swelling of the right foot; would be sometimes confined to bed, and had sometimes the phenomena of diabetes, associated with loss of appetite, dryness of the mouth, unquenchable thirst, dyspepsia, frequent vomiting after eating, and profound prostration. Lately he had cough, with free expectoration and sense of weight in the chest. Then follows a description of ocular symptoms.

But the history is strangely deficient in one vital particular—there is no record of the state of the urine, either as to quan-

[1] Plate IV., appended to another paper in this volume, will serve to show the principle upon which this test is constructed.

tity, analysis, or in any respect whatever. All the data from which the reader may form a judgment of the patient's disease are the symptoms above related, and certainly we are not authorized to quote the case as one of diabetes mellitus in default of any knowledge of the constitution of the urine. The case may have been one of albuminuria, and the plate I have always looked upon as an illustration of the retinitis of Bright's disease. There is no account of the final result of the case.

Bouchut, Du Diagnostic des Maladies du Système Nerveux par l'Ophthalmoscope, p. 442, states the occurrence of retinitis in glycosuria, and that its symptoms are identical with those of albuminuric retinitis. Guerineaû briefly makes the same allusion. Desmarres, Traité des Maladies des Yeux, t. iii., p. 522, narrates two cases of glycosuric retinitis, and finding them precisely similar to what is found in albuminuria, asks whether albuminuria may not have preceded the diabetes. Wecker does not allude to the matter. Martin, Atlas d'Ophthalmoscopie, p. 16, relates the case of a woman having glycosuria and loss of sight. Observing the papilla to be white and to reflect the light strongly, he states that the nerve was atrophied and had no traces of œdema or infiltration. He saw circular or oval hemorrhagic spots along the retinal vessels, and thought he saw little whitish spots of exudation. On this basis of induction he draws the diagnostic inference that glycosuric retinitis differs from albuminuric retinitis in respect of atrophy of the papilla, in absence of inflammation and in the oval form of the hemorrhagic spots. The exudations have a whiter tint than in albuminuria. On turning to the plates which are to show us these distinctions, we find the author's artistic powers to be even more wretched than his description and logic.

Without quoting authorities further, I give the particulars of the following case.

November, 1867. Mrs. M., aged 60, tall and spare, has for fourteen years had urinary trouble, and during three years past has been treated for it by Dr. B., who put her on rigid dietary regimen and administered opium, gr. j., ter in die. The case was clearly ascertained to be glycosuria, and under the above treatment the quantity of urine diminished and the

health improved. In the summer of 1867 she had double iritis. Before this attack of inflammation she says her sight was a little dim, and after it had passed away the adhesions of the pupils would account for an additional loss of sight. From her history it is impossible to fix the time when retinitis began. Her usual condition is as follows: Both eyes, H. $\frac{1}{2}\frac{1}{0}$. Right, V. $= \frac{2}{4}\frac{0}{0}$. Left, V. $= \frac{2}{6}\frac{0}{0}$. In left the pupil responds very little to atropia, and it is difficult through the small aperture to see the fundus; the nerve is hyperæmic, edges well defined, vessels a little turgid. Between the disk and the macula, minute glistening white points are seen in the retina, and at the macula they form a circle; they have the exact look of specks of fatty degeneration in color and arrangement and lustre. There are also a few ecchymoses, some of them near, others distant from vessels.

In right eye similar appearances are seen, but in a less marked degree; the tissue of the retina clear, and the vitreous a little hazy. The above appearances are absolutely identical with what I have often seen in cases of chronic renal disease, and I assumed such must now be the case. I tested the urine and found absolutely no albumen and abundant sugar.

I therefore determined on a rigid investigation to ascertain whether, as sometimes happens, albuminuria and glycosuria might not co-exist, the evidences of albumen being for the time in abeyance.

The patient was very intelligent and readily consented to aid my search. She kept a record of the quantity of urine passed per diem, and sent me specimens twice weekly. Not being able to detect albumen by the usual tests, my next effort was to see if there might be deficient excretion of urea, as must be the fact if there be serious kidney lesion. I employed Davy's test, which depends on the decomposition of urea by hypochloride of soda, with evolution of nitrogen gas. I also resorted to Haughton's tables for estimating the urea from specific gravity (see Roberts, p. 89). I made about twelve examinations from November to March, and unfortunately some of the records were lost, but the facts are, that the urine varied in quantity from ℥80 to ℥96 per diem; its specific gravity 1026 to 1028; no albumen; urea, in five examinations, was 356 gr., 412 gr

419 gr., 518 gr., 480 gr.—a quantity of urea quite sufficient for a woman whose weight was about 125 lbs. and whose exercise consisted in two hours' walking, and whose diet was chiefly animal food, but only in small quantities. Before my acquaintance with the patient her urine had been frequently examined, both chemically and microscopically, without finding evidences of renal disease. In December fresh hemorrhages took place into the left retina, and the glistening spots increased in number and extent, the fundus acquiring an appearance perfectly typical of albuminuric retinitis.

In February I thought I detected slight evidence of albumen in the urine, and got Prof. Flint, jr., to examine the fluid; his note reported urine in "color paler than usual, reaction acid, sp. gr. 1028, no albumen, sugar in considerable quantity; in the deposit a considerable quantity of pavement epithelium and an abundance of spores of vegetable growth."

The urine was again tested in May, and with the same results, viz., existence of sugar, absence of albumen, sufficient quantity of urea.

A fresh hemorrhage occurred into the retina in May. Up to that time there had been a degree of improvement of sight by absorption of the apoplexies.

Patient's general health continued fair; treatment consisted in the use of iron and tonics, without local treatment, except atropia to loosen the iritic adhesions.

I may remark that there is no evidence of syphilis. My conclusions from this case are that pure glycosuria is capable of causing retinitis, and that the ophthalmoscopic appearances cannot be distinguished from those which belong to albuminuric retinitis.

I may add one more remark, viz., that when I see a typical case of nephritic retinitis, my belief in the existence of renal disease is not shaken by absence of albumen, nor by absence of casts and other usual microscopic appearances. It is well known that those symptoms are very liable to disappear in chronic cases, and many examinations may be made before they can be detected. I have known one instance in which albumen and casts were found once, and could not be again detected; the patient lived several months, and his kidneys

exhibited most complete degeneration. A habitual diminution in the excretion of urea will help form a correct diagnosis, while, if characteristic retinitis have intervened, this evidence is exceedingly strong. The ophthalmoscope may then be styled a nephroscope.

But when we are constrained to admit that glycosuria and albuminuria may cause the same kind of retinitis, the question what is the element which causes this inflammation, becomes very puzzling. Some have thought that cardiac disease was the direct cause, but this has been proved repeatedly not to be true. Again we have conjectured that urea in the blood was the poison to the retina. But this is not true in glycosuria, and we are therefore not at liberty to assume that it is true in Bright's disease. Hence we are left without a valid theory to account for the peculiar retinitis which sometimes occurs in these cases of urinary trouble.

A Case of Herpes Zoster Ophthalmicus, in a Patient nearly Eighty Years of Age, causing Fatal Prostration. By B. Joy Jeffries, M.D., Boston. (1868.)

A. B., an active and healthy old lady nearly eighty years of age, was attacked December 20, 1867, by a violent neuralgic pain in and about the left eye, running over the forehead and on to the side of the nose. Three days later her physician was called, who regarded it as hemicrania, and prescribed aconite over the frontal nerve. This application did not afford relief. There were occasional remissions, but no real intermissions of the pain, as in true hemicrania. The temporal artery was so enlarged at this time as to form a tumor an inch in length under the skin upon the temple, and this in so marked a degree as to give rise to the idea of aneurism. The ocular conjunctiva was excessively inflamed, and an ophthalmic surgeon in consequence called in consultation, who found ulcer of the cornea but no iritis, and prescribed solution of atropine, precautionary. Subcutaneous injection of morphine was also used three times. Eruption on the skin was not noticed till the 25th, five days after commencement of pain, when "excoriations" were seen, covered by thick crusts upon the forehead,

side of nose and upper lid, not beyond the medium line, which were thought to be due to the application of aconite. Emollient applications were used over the parts affected, and the injection of morphine subcutaneously into the arm was the only other special treatment, with the exception of quinine. (The above brief account is given me by the attending physician.)

I first saw the patient January 3d, two weeks after the commencement of the disease, which I recognized at once as a typical case of *herpes zoster*, affecting the cutaneous and mucous distribution of the ophthalmic division of the fifth or trigeminal nerve—namely, the forehead, upper lid, eye and side of nose. There was swelling and hardening over the artery on the temple, and bunches under the skin; thick, deep-seated crusts scattered over the parts enumerated, where the skin looked unhealthy and had a peculiar pink tinge, exactly limited as the crusts, by the median line on the nose, forehead and scalp. One large crust occupied the edge of the orbit over the exit of frontal nerve. Crusts and scabs were expelled from inside of nose on that side, showing the mucous membrane to be implicated; also occasional slight nasal hemorrhage. The lower lid and cheek were not affected, the disease being accurately limited to the distribution of the ophthalmic nerve. The upper lid was considerably swollen and the conjunctiva inflamed and secreting a muco-purulent discharge, the cornea hazy, and vision reduced to counting figures at two feet; it could not be more definitely determined; considerable photophobia. The iris did not, so far as could be seen through the cornea, seem implicated. The pupil was dilated. Tension of the eyeball not ascertained, from refusal of patient. The general tone and vigor of the patient was good, appetite considerable, but capricious; the skin not drier than would be found in such advanced age; the tongue moist and but slightly coated; the pulse large, full, and 100 to 120; urine high colored, but not very scanty; patient drank considerable; the bowels had acted naturally or by enema. But that which was, so to speak, the essential element of the disease was the truly fearful pain in the parts affected, of a darting, lancinating and stinging character, with occasional remissions. The skin was tender to pressure, and yet not sensitive. During the next three weeks

—making six in all—the disease ran its course, the pain ceasing January 24th. The patient kept her strength and some degree of appetite for the first four weeks, but gradually broke down under her suffering. The pulse kept up to at least 90, hard and full. By the time the pain ceased the patient was very much enfeebled and emaciated, and I then for the first time felt fearful she might not rally. She gradually faded away and died on February 1st, the forty-fourth day from the commencement of the neuralgic pain, without any symptom of other trouble, and retaining her mind to the last. The eyelid had recovered its normal appearance, as also the side of the nose. The conjunctiva remained somewhat injected and the cornea hazy, *probably* also loss of sensation in it. The lid could be voluntarily raised, and secretion had stopped. The crusts on the forehead and scalp, where the pain was the last to leave, remained, and the ulceration was deep and considerable. These crusts were still present post mortem. No examination was made.

As to treatment, I was not able, while in attendance on the case, to follow out any thing thoroughly. The patient was extremely self-willed and averse to doing any thing that could not be promised as a miracle to relieve her suffering, which was so acute as to well excuse her fear of medicine, since she imagined every thing done but increased the pain. Opium dulled the pain but little, and acted badly on the digestive system and brain. Quinine was taken, six grs. a day, for a few days, and I think with some benefit, enough at least for me to use it again another time. The patient would take but little stimulant, which, however, did good, especially toward the end of the disease. The last ten days she refused almost all nourishment. Excitement and mental irritation rendered the paroxysms worse. From the absence of general febrile symptoms I thought possibly digitalis might control the excessive action of the heart, and thereby mitigate the pain by less force in the arteries. Ten drops of the tincture once was all the patient would take. I was not sure, but thought this amount had some quieting effect, and should be led to employ an arterial sedative a second time. After pretty free action of cathartic medicine once or twice the pulse became fuller and

slower (75 to 80), but went up again within twenty-four hours. When the disease had run its course then the pulse was feeble, small and not very quick, with great prostration. The thought of section of the frontal nerve the patient would not have entertained for a moment, and it was not proposed, as it would not have relieved the pain in the eye and side of the nose. It might have been in place after the pain had retreated to the forehead and scalp.

In looking over the authorities I find that several—Cazenave, Erasmus Wilson, Hardy, Fuchs, Neligan and Tilbury Fox—speak specially of ulceration and gangrene possibly occurring, particularly in old people, from herpes zoster. Fuchs alone says: "It may be fatal. This result has been but seldom observed. Fr. Hoffman had two fatal cases from gangrene. It may also occur from metastasis, or ulceration and hectic fever."

I do not find it anywhere suggested that death might occur by exhaustion from the pain in the aged. That this was the cause in the case I have related there is in my mind no doubt, and I have the concurrent testimony of Drs. S. Morrill and Charles G. Putnam that no other symptom of disease could be found before death, after the pain had ceased and the disease run its course.

Cases of herpes zoster or shingles on the trunk are so often seen and so well understood that I need not stop here to give any description of the disease in general. But as I find that it is not understood, or perhaps believed, that this is a complaint which may occur from the crown of the head to the feet, over the course of distribution of the cutaneous nerves, I will here quote from Prof. Hebra, with whom the recent English and French authorities agree. He says: "Under herpes zoster I include all those skin affections which present the character of herpes, and in which the part of the surface occupied by the groups of vesicles corresponds to the distribution of certain cutaneous nerves, and which, lastly (whether occurring on the head, trunk or limbs), are confined to one-half of the body. It is only in rare and exceptional instances that *herpes zoster* attacks both sides simultaneously." "The localization of this disease was formerly much more strictly limited,

the only cases which received the name of *herpes zoster* being those in which the eruption is seated on the trunk of the body (and chiefly on the chest), and is confined to one-half of it. Further observation, however, has shown that, besides the chest, any part of the trunk or limbs, and even the neck, face or head, may present a similar efflorescence, affecting one side only; and that the changes through which the vesicles pass, and the whole course of the affection, are in these cases exactly the same as in the disease which occupies the trunk, and has always been regarded as the typical form of zoster."

In support of these views I give a table which I have compiled from the annual reports of the Vienna General Hospital for the years 1857 to 1866, inclusive, showing the number of cases and the regions of the body affected with herpes zoster.

Cases of Herpes Zoster on Different Regions of the Body, occurring in the Skin Department of the Vienna General Hospital, 1857 to 1866; ten years.

Herpes Zoster	1857.	1858	1859.	1860	1861	1862.	1863	1864.	1865	1866	Total.
Capitis	.	..	1	..	..	..	..	..	..	..	1
Facialis	..	..	..	1	..	2	2	2	2	..	9
Collaris	2	..	..	..	..	..	..	..	..	1	2
Nuchæ	1	..	..	..	..	2	1	1	..	..	5
Brachialis	2	3	..	2	..	2	1	1	2	1	13
Pectoralis	5	5	2	6	1	6	8	6	5	4	44
Abdominalis	1	1	..	..	..	..	2	2	..	..	6
Progenialis	..	..	..	..	..	..	1	..	..	..	1
Perinæum	..	..	..	..	2	..	..	..	..	..	2
Femoralis	2	..	..	1	1	..	1	2	5	1	12
Total in year.	13	9	3	10	4	12	16	14	14	7	102

Trousseau (Clinique Médicale) says: "One of the most characteristic phenomena of herpes, at least with old people, I have found to be the persistence of the pain after the disappearance of the eruption. This pain, in the same degree of severity and causing intolerable suffering to the patient, often persists not only for several months, whilst the cicatrices left after the formation of the bullæ are still apparent on the skin, but may even last a number of years.

"I have known an old lady who, at seventy, had shingles, and who for fourteen years afterward still suffered the most terrible pain, especially at night. Now I have under treat-

ment a lady of sixty, who for five years has been terribly tormented by the pains of herpes. I have noticed several times a singular phenomenon: the simple contact of the clothing often provokes the most unspeakable torture, and yet the skin has superficially a kind of insensibility, which lasts often long after the pains have ceased.

" If the prognosis of zona is not grave in that the patient's life is not hazarded, it is grave in that, with old people at least, its sequela may be intolerable suffering, to the despair of the patient and physician."

The subjects of this clinical lecture were two or three patients with herpes zoster then in the Hôtel Dieu, under Prof. Trousseau's care.

With regard to distribution, Prof. Hirsch says that herpes is wide spread over the earth's surface, among all races of men. He quotes Pruner as having seen it very frequently among the negroes in Egypt; on the other hand Pollack noticed very few herpetic forms in Persia, and Thomson never saw or heard of a case of herpes zoster among the natives of New Zealand. In regard to its relative frequency upon the two sides of the body writers differ, but in putting together a large number of cases we find that it occurs about as often on one side as the other.

Prof. Christian A. Voigt has most minutely dissected and studied the ramifications and distribution in the skin of the separate cerebro-spinal nerves, and published his researches in the Memoirs of the Imperial Academy of Vienna, 1864. Prof. Hebra says: " On the head, neck and limbs, the tracts of nervous supply pointed out by Voigt agree perfectly with the results of observation in cases of zoster. On the trunk, however, the correspondence seems at first sight to fail. For the dorsal and lumbar nerves are distributed to the skin by three separate sets of branches (posterior, lateral and anterior), which form as many ' tracts of nervous supply' running *vertically* on either side of the body. In reality, however, each of the dorsal and lumbar nerves takes a separate course forward from the spine to the front of the trunk, and the position of the vesicles of zoster accords perfectly with the distribution of these nerves."

Voigt, from his dissections, followed since 1851, deduces—

1st. Every sensitive nerve-bundle supplies with its peripherical termination a definite larger or smaller district of the skin of the human body, and these districts belong to a definite and constant number of bundles. The mosaic of position and arrangement of these larger or smaller portions of skin and the peripheric terminal distribution of the sensitive nerves in them is, therefore, not arbitrary or accidental, but positively determined.

2d. This definite mosaic in the arrangement, position and ramification of the peripheral termination of the nerves very probably corresponds to a definite arrangement and position of the origin of the nerves in the nervous centres, brain and spinal cord.

3d. Anomalies occur only in the direction and course of the nerve from the centre to the periphery. Just as in the telegraph it makes no difference whether the connection between two stations is longer or shorter or doubled on itself, so the cutaneous nerves, when running irregularly, even doubling on themselves, yet reach a determined portion of the skin, and there first ramify.

4th. The number of nerve fibres held in any bundle receiving a special name is not always the same, for the fibres, in their course from centre to periphery, change company, join often neighboring nerve branches to again leave them, till. finally, they ramify on their determined portion of the skin.

Amongst various anomalies which Prof. Voigt has found, and from which the above deductions are made, are, in reference to the nerves implicated in our case, the following:

The *lacrymalis* may be thicker than ordinary, twigs of the *supraorbitalis* running with it in its sheath. As a rule, the lacrymal supplies, in its final distribution, only a small part of the upper eyelid above the outer angle, and about six lines outward. I have found cases where a twig of the *lacrymalis* supplied one-half of the skin of the upper lid. Here commenced the twigs of the *supraorbitalis*, which generally emerges from the orbital foramen, but here ran down to the upper lid and joined the bundles of the *lacrymalis*, instead, therefore, of running along the upper wall, ran by the external upper angle of the orbit.

"The *infratrochlearis* becomes thicker by uniting with it twigs of the *ethmoidalis*, which reaches the skin of the end of the nose between the bone and the *cartilago-triangularis*. The terminal twig of the *ethmoidalis* here runs, instead of *inside*, above the ethmoidal cells and along the anterior wall of the nasal cavity, *outside*, joining with the infratrochlearis to the skin of the ridge of the nose, and so to the end where it ramifies."

For the general distribution of the ophthalmic nerve I would refer to the special anatomies. Mr. Hutchinson has given it very perfectly and succinctly in his paper in the Ophthalmic Hospital Reports. I quote the above from Prof. Voigt, as the anomalies he found in dissection may possibly explain cases which might occur of herpes zoster ophthalmicus not apparently following strictly the usual distribution of the trigeminal.

The part concerned in our case is what Voigt calls the "anterior district of ramification of the head and face," beginning on the squama of the occipital bone, and running over to the chin. In this ramify the anterior subdivisions of the first, second and third branches of the trigeminus. Draw now a horizontal line, about six lines long, from the external angle of the eye to the "lateral border line," and a line from the internal angle directly to the end of the nose near the anterior part of the nasal opening, and these two lines, with the commissure of the eye, will separate the district of ramification of the first from the second trigeminal branch. In this district terminate the supraorbitalis, frontalis, supra et infratrochlearis, lacrymalis, and the end of the ethmoidalis, on the point of the nose.

"The ramifications of the supraorbital do not, as generally given, end on the crown, but run on further and reach the squama of the occipital bone."

This last fact explains the portraits of the disease given by Drs. Boeck and Danielsen, and Prof. Hebra.

I think, very naturally, medical gentlemen may be inclined to doubt the correctness of my diagnosis in this case, or perhaps even the existence of so curious and sometimes so formidable a disease. I shall, therefore, in support of my views, take the liberty of here quoting gentlemen whose opinion and

observation will be unquestioned. Mr. Jonathan Hutchinson, in the Royal London Ophthalmic Hospital Reports, says, of herpes zoster affecting one or all the branches of the ophthalmic nerve: "This most interesting disease has as yet received but little attention from writers on skin diseases, and, as far as I am aware, scarcely any from ophthalmic surgeons." "The disease is, I am persuaded, more frequent than is generally supposed. In proof of this I may mention that, during the last year, no fewer than three patients have consulted me in private on account of its effects. I have found most surgeons very incredulous as to this disease, and free in asserting that they had never seen it, and that it must be extremely rare. My conviction is that it is often misnamed. It is often considered to be erysipelas. Three patients who came to me with the unmistakable marks of herpes on one side of the forehead had been treated for a disease which had been said to be erysipelas, and several others in my series had also had a similar diagnosis given. Yet it is easy enough to distinguish the one from the other, if attention be once drawn to their differences. Herpes frontalis is always limited to one side—never transgresses the median line of the forehead and nose. It never affects the cheek, although there may be some sympathetic œdema of the part (œdema of contiguity). There is less general swelling of the skin than in erysipelas, and in some cases very little. The vesicles of herpes are smaller, more defined, more numerous, and altogether much more conspicuous and pronounced than are the bullæ of erysipelas. There is much more pain and much less constitutional disturbance in herpes than in erysipelas. The strictly unilateral character of the one, contrasted with the irregular location of the other, is, however, the most reliable feature for the purpose of ready diagnosis." "Herpes almost invariably leaves scars, often deep ones, and by the arrangement of these (unilateral) it is usually easy to recognize a patient who has suffered from the disease, even years after its occurrence." In proof of this latter we would refer to a photograph and wood-cut in the Ophthalmic Hospital Reports given by Mr. Bowman, who there says, in regard to ophthalmic shingles: "Cases of this nature have attracted my attention during many past years." "I have

frequently seen this disease mistakenly called 'erysipelas,' even by accomplished practitioners. From this it is distinguished by the pain preceding the symptom, by the mingled numbness, pain, and heightened sensibility remaining for a long period after the inflammatory outburst, and especially by its not overpassing the median line." To show that these views are supported by absolute observations, I will here introduce a tabulated statement of twenty cases of this form of zoster, collected by Mr. Hutchinson, and thirteen cases reported by Mr. Bowman, all occurring within the last few years. They certainly would seem to show that the complaint is not so very infrequent, and would be oftener noticed were it always diagnosticated. (See table, pp. 90, 91.)

I have not hunted through the journals for reports of individual cases, as I thought these thirty-four, occurring within the last few years, were sufficient at least to identify the disease and prove the correctness of my diagnosis. I shall not here attempt to solve the nosological riddle presented to us by herpes zoster in general, but would refer to monographs, etc., of Fenger, Forget, von Barensprung, J. Russell, Pundschu, Singer, Crépinel, Gerhardt, Parrot, and finally to Mr. Hutchinson, in the London Hospital Reports.

In regard to the special form of *ophthalmic* herpes, if we may draw conclusions from this table of thirty-four cases, we can say that it may affect the frontal branch alone, or the frontal with one or more of the others. It does not seem to affect the other branches *without* the frontal. The eye is not affected when the frontal alone is involved. The danger to this latter organ is very great, as it has at times been destroyed or useful vision taken from it. Mr. Hutchinson says: "I have seen several cases in which the cornea, sclerotic and iris became involved in inflammation. As a rule, I think the eye does not inflame until the eruption is at its height or already beginning to decline. In one case, however, a single nodule of lymph near to the pupillary edge showed itself in the early stage, and without any ulceration of the cornea. More usually the ulceration of the cornea is extensive, and often it prevents a satisfactory inspection of the state of the iris. There is always great congestion, both of conjunctiva and sclerotic, and this

congestion, as well as the corneal ulceration, is very slow in disappearance. The pupil, even when there is not much lymph visible, is always very sluggish, and in several cases I have found it impossible to make the iris act by atropine, even by strong solutions frequently repeated. I have never seen hypopyon in connection with this form of ophthalmia, nor does the other eye seem to suffer. According to my experience, herpes zoster frontalis is more frequent in the aged than in the young, and also more severe. The liability of the eye to suffer also appears to be much greater in the old." "When the disease has subsided, the eyeball is usually left somewhat anæsthetic, though perhaps at the same time liable to neuralgic irritability. In this it shares with the skin, which, although perhaps very painful, is always numb as regards common sensation. In the after stages the patients often complain that the skin feels 'numb and stiff like parchment.'" Mr. Bowman says: "It is not always possible to examine the eye accurately during the herpetic attack, owing to the swelling of the lids; but when this subsides, it is usually easy to ascertain what tissues have suffered. I have seen nothing like herpetic eruption on the conjunctival surface of the lids or globe. The conjunctiva may be too red, the eye may be watery and intolerant of light, and the peculiar pain of the affection may be experienced in, or referred to, the organ itself; but usually there is no primary disease, such as corneal or iritic inflammation, coincident with or forming a part of the eruptive stage of the complaint. If these occur, they seem rather to follow after a short interval. Small softenings or ulcerations of the cornea, rather marginal than central, and slight iritis, are the more common complications, but rather the former than the latter; and they have seemed to me to bear considerable resemblance to those following small-pox, both in their course and the treatment they demand."

I avoid speculation on this form of the disease in our present knowledge of it. Mr. Hutchinson says: "There can be little doubt that the local processes of inflammation in the skin and the eye are produced directly through the medium of the nerve, in this instance, of the ophthalmic division of the fifth (some or all its branches). At what part of the nervous sys-

tem the irritation begins, however, we are quite in the dark. I can see no arguments in favor of the belief that it is produced by the vaso-motor rather than by the sensory trunks. It appears always to follow accurately the distribution of the latter." "This singling out of one particular nerve-branch might seem to imply that the irritation, whatever it is, attacks the nerve-trunks after their subdivision. It is possible that it may be brought to bear upon them through the medium of the vaso-motor ganglia. This conjecture is very different from the one which would attribute the whole production and localization of the disease to vaso-motor filaments. Other arguments might be held to support the conjecture that the irritation starts from the cerebral ganglia of origin for the nerve concerned." "I must beg to warn against hasty inference, from the fact that sometimes only one branch of the ophthalmic nerve, and sometimes all are affected; that it is therefore probable that the disease commences in the nerve-trunks after subdivision, rather than in the cerebral or ganglionic centres common to them all. Such an inference is surely most unfounded. The nerve tubules which are to be distributed, as the 'frontal nerve,' for instance, are just as distinct from those constituting the nasal branch, when they are bound up in one bundle and called collectively the 'ophthalmic nerve,' as they are subsequently, when divided. There can be little doubt that, whatever may be their mutual relations for convenience of transit, they are perfectly distinct from one another, from beginning to end. It is therefore easily comprehensible that a source of irritation, beginning either in the Gasserian ganglion or in the mesocephale itself, may be restricted in its influence to one branch only."

Dr. M. Singer records a case of herpes zoster following all three branches of the fifth, and in which it was observed that the two senses of touch and taste in the tongue disappeared and reappeared in strict unison, thus giving strong corroboration to the idea that the lingual is a nerve of taste. (Biennial Retrospect of Medicine.)

Dr. P. Gerhardt says that the group of diseases in the course of which zoster facialis is frequently observed is distinguished by the frequency of the initial rigor, or the occurrence of an

increase of temperature to 30° Réaum. (104 F.) even on the first day. Gerhardt remarks that this affection does not attack the trunk or limbs, but only the face, and thinks that the irritation must be caused by the following peculiarity of the fifth nerve. The branches of this nerve run through narrow, long canals, along with small arteries; these arteries contract in the initial rigor, but then *dilate*, and their abnormal size creates a pressure on the branches of the trigeminus and the sympathetic. The occasional result of the damage to the latter is the occurrence of a vesicular eruption on the skin. He thinks that when this has once occurred an accommodation takes place, in virtue of which a second attack of febrile dilatation of the vessels does not irritate the vaso-motor fibres so as to cause the eruption. (Biennial Retrospect of Medicine.)

As regards treatment, Mr. Hutchinson says: "Whilst our pathology is so uncertain, we can allege nothing with confidence. I have always been in the habit of ordering quinine, and using any simple local application which may seem most appropriate to the stage of the eruption. Lead lotion at first, or free applications of oil, or, if the pain be very severe, of laudanum, are all useful." Mr. Bowman says: "I wish I could state any thing very satisfactory as to the treatment of the after-pains, which are sometimes so severe as to make the patient weary of existence. In Case IV., subcutaneous division of the nerve was only undertaken after almost all other remedies, local and general, had failed. It certainly for a time took away all feeling from the region to which the frontal nerve is distributed, and when touched in this region the patient no longer experienced the pains which previously tormented him. But in a few weeks the sensibility had returned, and even at first the pains in the neighboring parts to which the remedy had not extended seemed such as to make the partial relief very little appreciated. It may be also that the morbid condition of the nerve on which the pain depended was not confined to the part peripheral of the point of section, and that the central portion continued the seat of pain. Perhaps if it had been possible to divide the nerve further back, the relief would have been greater."

"In Case VI., very marked relief did follow section of the

nerve, and with clear evidence of the fact. When the frontal nerve was divided, the frontal pain was greatly lessened. When the external nasal branch was cut, pain was no longer referred to the skin of the nose, while the inner surface of the nostril continued to be the seat of distressing pain, and I could think of no way of dividing the inner branch entering the nostril far back through the ethmoid. The relief, so far as it extended, was in this case so permanent and considerable as constantly to elicit the patient's thanks. The result in this case would incline me to recommend the division of the nerve, a very harmless proceeding under chloroform, whenever the after-pains are severe and continuous in spite of time and other treatment."

In the case I have related, as I have above said, division of the frontal nerve would not have been of special service till pain had left the parts supplied by the other branches of the ophthalmic, namely, upper lid, side of nose and eye. This it did not do till after the fourth week of the disease, when any operative interference would not have been tolerated by the patient.

Dr. Crépènel reports that he has found great benefit in the treatment of neuralgia in herpes zoster from the local application of chloroform and oil (one part to five), some five or six times daily. The proportion of chloroform to be increased when the pain is very severe; the remedy to be applied as early as possible in the disease.

I will finish with the following quotation from the British Medical Journal, Vol. i., 1866, p. 470, as it applies to two cases in Mr. Hutchinson's table and to the plate published by the Sydenham Society:

" A few months ago, at a meeting of the Council of the New Sydenham Society, the new plates of the series of skin diseases were presented to the Council for approval. One of these plates, representing a specimen of herpes zoster of the head and face, excited a little amusement among some of the mem bers. 'Who had ever seen the disease in such a part? Surely it was unnecessary to depict so rare and far-fetched a complaint.' Curiously enough, one of the Council, Dr. Markham, who had had his joke on the occasion, was himself last week

pronounced, by his friend Dr. Stewart (another of the unbelieving ones), to be 'a splendid specimen of that very disease we were joking about a few months ago at the Council of the Sydenham Society.' Herpes zoster of the head and face is, however, no joke to the patient. A man need wish his worst enemy no worse week's or fourteen days' excitement than that of an attack by it. In the present case the disease was limited to the course of distribution of the left supraorbital nerve, and showed, throughout, its distinctive nerve character. Five days before the eruption appeared there was constant neuralgia of the aforesaid nerve and hemicrania. Considerable itching and several hardish and painful subcutaneous elevations preceded the vesicular eruption. The eruption was markedly limited to the left side of the forehead and head and the root of the nose, and to the left upper eyelid."

The plates exhibited are from Mr. Erasmus Wilson's series, and the portraits from Drs. Boeck and Danielson, Prof. F. Hebra, and the New Sydenham Society, and Barensprung and Hebra's Atlas.

Considerations zur le Zona. Parrot. Paris, 1857.
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Forget. Brit. Med. Jour., Nov. 30, 1861. On Treatment of Zona.
Von Barensprung. Annalen der Charité Krankenhauses zu Berlin, Vol. ix., Vol. x., Vol. xi. 1861–63.
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Pundschu. Singer. Crépènel. Gerhardt. Schmidt's Jahrb., 127, 128.
J. Hutchinson. Med. Times and Gazette, Oct. 19, 1867, p. 432. "Several interesting cases of herpes on forehead have been recently under care." Roy. Lond. Ophth. Hosp. Reps.
Annual Report of the Netherlands Ophthalmic Hospital. F. C. Donders. 1863–66.
J. J. Maats. Two Cases Herpes Zoster Ophth.

MR. HUTCHINSON'S TABULAR STATEMENT OF 20 CASES OF HERPES ZOSTER FRONTALIS, SEU OPHTHALMICUS.—*Oph. Hosp. Rep.*, Vol. v., Parts 3, 4.

No.	Name—Date—Reference.	Age.	Health, premonitory Symptoms, &c.	Parts affected.	Nerve affected.	Remarks.
1	Geo. Morgan, Opht. Hosp., Sept. 9, '61.	63	Florid; nearly bald.	Left forehead, upper eyelid, iris, side of nose to tip.	Whole ophthalmic division of fifth.	The eye inflamed, and was practically lost.
2	Mrs. Kimpter, Metr. Fr. H., Dec. 17, '61.	26	Very pale and feeble.	Left frontal region and mid region of side nose.	Frontal and both trochlear branches.	Eye not inflamed.
3	Wm. Woolgar, Mar. 29, 1862.	3½	In usual health.	Right forehead and mid region of side nose.	" "	Eye not inflamed. Portrait by New Sydenham Society.
4	Joseph Bond, July, 1859.	56	Subject to bronchitis.	Left forehead.	Frontal division only.	Eye not inflamed. Shingles also, at same time, right side of the chest.
5	A. B. Clerk, Ophth. Hospital.	25	In good health; ten days' premonitory pain, severe.	Left forehead.	" "	Eye not inflamed.
6	Mrs. Barnes, Opht. Hospital, June 9, 1863.	64	Pale and thin, but in good health; severe headache preceded, but not confined to the forehead.	Right forehead.	" "	Not very severe case. Eye not affected at date of notes. No subsequent record.
7	J. Thomas, Ophth. Hospital, April, 1865.	17	Healthy sailor.	Forehead and side of nose.	Frontal, trochlear and oculo nasal branches.	Notes imperfect, and do not state more than that there was not much mucous discharge from the eye.
8	J. Anderson, Opht. Hospital, June, 1866.	69	Tailor, in good health. Had pain in part, and slight rigor the day before eruption came out.	Left forehead, side of nose, iris, cornea, &c.	" "	Extensive opacities of cornea and posterior synochia. Pupil did not dilate to atropine.
9	Mrs. B., of Sutton, Bedfordshire.	68	A spare but healthy lady.	Left forehead, side of nose, cornea, conjunctiva and iris.	" "	Patient came month after attack, on account of the damage to the eye.
10	Mrs. M. Hertford.	66	A lady in rather feeble health, and with suspected renal disease.	Forehead, conjunctiva, side of nose, cornea and iris.	" "	Patient came, as last case, on account of eye. Cornea hazy, pupil fixed, skin numb.
11	Mr. —— Hackny.	60	A very healthy man.	Left forehead, side of nose, conjunctiva and cornea.	" "	Sent me on account of cataracts.
12	Dr. Markham.	46?	Good health.	Left forehead and side of scalp.	Frontal; eye did not inflame.	This accomplished, physician was himself the patient.
13	A girl, Lond. Hosp. Dr. Parker's case.	16?	.....	Left forehead, side of nose, and iris.	Frontal, trochlear and oculo nasal branches.	Shown me by Dr. Woodman.
14	Danielsen & Boecks, Atlas Skin Dis.	65?	Good health.	Right forehead and side scalp.	Frontal.	No inflammation of the eye.

15	Rayer's case, Man.	47	... .	Left forehead.	Frontal division.	Eye not mentioned.
16	Dr. Broadbent, Pt., an officer.	23	Spare, but in good health.	Right forehead and side of nose, but not to tip.	Frontal and both trochlear branches.	The eye inflamed, and the cornea was slightly opaque.
17	A girl.	12	....	Forehead.	Frontal.	Eye not inflamed.
18	Mrs. ——, Ophthalmic Hospital.	60	Good health.	Right forehead and side nose.	Frontal, trochlear and oculo nasal branches.	The side of the nose chiefly affected. Complete blindness resulted.
19	Mr. Parker, Ophth. Hospital.	14	Strumous looking.	Left forehead, scalp and upper lid.	Frontal.	Mild course. No inflammation of the eye.
20	A. B., case of Mrs. Ransom, Bowd.	43	Good health.	Left forehead.	Frontal.	No vesicles on nose, and no inflammation of eye.
	A. B.	80	My own case. B. J. J. Good health.	Left forehead, scalp, lid, side of nose, eye.	All branches of ophthalmic.	Disease ran its course in 36 days; patient died from exhaustion on the 44th day.

Mr. Bowman's Thirteen Cases of Herpes Zoster Frontalis, seu Ophthalmicus.—*Ophthalmic Hospital Reports*, Vol. vi., Part 1.

No.	Name—Date—Reference.	Age.	Health, premonitory Symptoms, &c.	Parts affected.	Nerve affected.	Remarks. Complications.
1	Miss B., Oct., 1855.	40	....	Right forehead.	Frontal.	Ophthalmia and corneitis right eye, leaving nebula.
2	Miss H., 1860.	57	Had bad inflammation of o. d.	Right forehead.	Frontal.	Corneitis and iritis right eye, leaving dense nebula.
3	Mr. W., 1858.	36	Has had diplopia.	Left forehead.	Frontal.	Internal strabismus left eye; diplopia.
4	Mr. L., July, 1865.	70	.....	Left forehead and scalp.	Frontal.	Conjunctivitis. Supraorbital nerve divided; no permanent benefit.
5	Mr. S., Jan., 1864.	44	....	Left cheek and temporal region.	Sub-maxillary and frontal.	Atrophy of optic nerve, left eye.
6	Sam. H., Nov., 1864.	55	... .	Left side of head, cheek, nose and lids.	Frontal and nasal.	Corneitis leaving nebulæ, left eye. Supraorbital and infratrochlear divided; considerable relief.
7	Miss S., 1864.	60	....	Forehead, right.	Frontal.	Nebulous cornea, right eye.
8	Mrs. S., Sept., 1866.	52	....	Right forehead and infra-orbital region.	Supraorbital and infra-trochlear.	Ulcers of cornea, iritis, right eye.
9	Ed. H., Nov., 1866.	70	.....	Right forehead, temple and upper lid.	Frontal.	Thickening of lid, globe not affected.
10	Jos. Haynes, 1867.	4	.....	Left forehead.	Frontal.	No affection of the eye.
11	Ths. Redburn, 1865.	9	....	Right forehead and upper part of nose.	Frontal and nasal.	Leucoma right cornea (due to herpes?)
12	A. Turnbull, 1867.	12	....	Forehead (right?)	Frontal.	No vesicles on nose; eye not inflamed.
13	Anne Robins, 1867.	44	....	Right forehead.	Frontal.	" " " "

Remarks on the Operation for Cataract by Modified Linear Extraction—Graefe's Method. By Henry D. Noyes, M.D., of New York.

A trial of this mode of operating during two years, upon twenty-one cases, has convinced me of its superiority over other methods, both in facility of performance and the success of recovery.

In certain points of detail my views differ from the directions laid down in Graefe's original papers, and his practice is not now exactly what it then was. I am aware that others have adopted modifications similar to some I have fallen upon, but this has not been simple imitation, but similarity of experience, and mine may be taken, in corroboration of others, for what it may be worth.

1. *Anæsthesia.*—I have lately been more disposed to give chloroform than at first. The operation is painful and the eye difficult to manage when a speculum is used. I prefer to use a speculum, have employed many patterns, but have not yet found one of universal application. The objections to anæsthesia are twofold. Chloroform is dangerous to life. I use this rather than ether, because a smaller napkin may be used, and the profound narcotism which must be secured is more easily and certainly obtained than by ether. I have had the good fortune to escape any fatal results, but in three instances have had complete suspension of respiration and of heart contraction. This inanimate state continued for a period difficult to estimate, but probably for from one to three minutes. Artificial respiration was the chief reliance for restoration, and besides effusion of cold water, pulling the tongue forward and aqua ammonia were resorted to. Suppuration of the eye ensued in one of the above cases—the subject a very feeble old pauper, an inmate of the almshouse for several years. There can be no doubt that chloroform is more dangerous in eye surgery than in other operations, because a more profound effect must be obtained, namely, entire muscular relaxation, as is required in reducing dislocations. It will, however, be preferred by many to ether, because it more certainly and quickly brings about deep anæsthesia, while the surgeon is always so

situated that he can vigilantly watch the patient's behavior, and instantly suspend the chloroform when tokens of danger appear.

2. The wound which Graefe at first recommended was to be from 4‴ to 5‴, *i. e.*, nine to nearly eleven millimetres long, to begin and end $\frac{2}{3}$‴, that is, almost two millimetres from the cornea, and the middle to lie at the same distance, the height of the flap being 2‴. After carefully practicing the incision on the cadaver and on the living subject, I have no doubt that the incision ought always to be 5‴ or $5\frac{1}{2}$‴ in length, and its ends to lie $\frac{1}{2}$‴ from the cornea, while the middle touches the corneal margin. The incision will, when of this length, always permit the cataract to emerge with perfect ease, and render unnecessary either hook, spoon, or any traction instrument. The situation chosen is to be preferred, because it gives greater guaranty against luxation of the lens and loss of vitreous. I have come to look upon a small wound, which makes a tight fit and some squeezing of the lens, as a most pernicious circumstance. It has seemed to me to be the most fruitful source of mischiefs, viz., iritis, suppurations of the wound, and even of the globe. Prolonged efforts of expulsion are very undesirable; hence I greatly prefer to add $\frac{1}{2}$‴ or even three millimetres to the length of the wound to secure a quick and easy delivery of the lens. I also decidedly prefer to locate the incision in the situation which Arlt chooses, neither so far in the cornea as Mr. Critchett, nor as far back as Graefe. The deep sclerotic wound is more liable to cause prolapsus of vitreous, annoyance by conjunctival bleeding, and chronic cyclitis.

3. The knife should not, in my estimation, be so narrow as Graefe directed. The objections to it are that one is tempted to make too small a wound, and the edges are very apt to be irregular, because the cutting is by a to and fro movement. I have examined my cuts on the cadaver and found them very jagged, unless I had made great traction in cutting. I have noticed the same in operating. To obtain a smooth and regular wound of sufficient length and at the periphery of the anterior chamber, I have experimented with various knives—have tried such as Steffan proposes, the curved edge of Zehender, and the lance-knife of Adolphe Weber. The last is, to

me, exceedingly clumsy. I have adopted a form which contains the principle of Zehender's knife, but differently modeled.

From the point the cutting edge is the arc of a circle of four inches radius; at the summit of the arc the edge is prolonged backward, parallel to the back, for a distance of 4‴, making the distance from point to heel $1\frac{1}{4}$ inches. Preserving this model in the edge and keeping the back perfectly straight to the point, I have had the blade made of two sizes as respects width—the smaller measures at the widest part 3 mm., and the next 4 mm. The smaller size is oftenest used. The necessity for different widths is to overcome the difficulty of making a peripheral cut in a very deep-set eye. When the globe is deep in the orbit and the palpebral opening small, the blade must cut more rapidly as it enters, otherwise its progress is soon arrested by striking the inner canthus. Under these circumstances, I have in three operations made an inferior section with iridectomy, and with good visual result. I can affirm of these knives that they penetrate with great facility, they cut smoothly, they permit entire freedom in manipulation. The counter-puncture is made with great facility and with little tendency to push the globe inward, because the point is so thin and sharp. The handle is larger than usual and octagonal. These knives have been made for me by Otto & Rynders.

Another advantage which belongs to these knives is that, by their superior cutting power, there is less liability to prolapsus of the iris into the wound before completing the section.

I have been frequently led to employ, as Arlt does, the small, sharp hook to open the capsule, as the second step, and then with it to draw out the iris, making iridectomy the third step, and thereby avoiding the hemorrhage which sometimes embarrasses the laceration of the capsule. I need hardly say that a thorough tearing to pieces of the capsule is extremely important. In the delivery of the lens the globe is to be seized close to the cornea, at a point diametrically opposite the middle of the wound. The operator should hold the forceps, and with a curette or spoon press pretty firmly on the posterior lip of the wound. The forceps not only drag the eye down, but make direct pressure, so as to become an expelling force. I much

prefer the forceps to the finger. I have not used pressure on the face of the cornea by the hard rubber spoon, but think it may sometimes be useful to push forward a lens which moves slowly. I have found the expulsion of soft lens matter made very complete by pressing on the surface of the cornea with the tip of the finger, and opening the wound by a curette. If the section has been made below, Weber's shovel is a convenient instrument for counter-pressure; in the upper section it is frequently impossible to find room for it, notwithstanding a sharp bend. The chief point, to my mind indispensable to success, is that the lens makes its escape easily, and the great obstacle is narrowness of the wound. I therefore deprecate hooks and spoons and "slipping manœuvres," and insist on a wound 5‴ long, which will always permit the largest cataract to pass without difficulty.

It may be said that hereby the peculiar advantages of linear extraction are given up. In strictness, the wound is never linear, but makes a low flap, and the difference of 1‴ in length does not so greatly increase the height of the flap as to render the wound liable to gape or to induce prolapsus of the iris. The peripheral situation constitutes an advantage for coaptation of the highest value, and thereby secures prompt and firm adhesion. In this, coupled with the comparatively large size of the wound, consists the essential superiority of this operation above flap extraction.

Since I have adopted the larger sclerotic wound, viz., 5‴ or 5½‴ long, I have not seen any cases of suppuration; but the three cases out of four which I had had before were, in my judgment, brought to this state by the contusion of the wound and prolonged manipulation in getting out the lens.

In three cases I have extracted very immature cataracts; protracted iritis followed in two, but the patients were restored to good sight within four months by iridectomy. The cataracts had gone so far as to disqualify the patients from work, and had remained stationary in one case a year, in another case five years. I therefore felt called upon to interfere. I should, under such circumstances, recommend an extraction without discission, just as if the lens were fully opaque.

I may remark the curious fact that one cataract extracted

this winter fell into two halves as it came out, dividing in its equatorial plane, like the cotyledons of a pea. Dr. Delafield related to me a case where the lens *in situ* was split in this plane by a blow, and one-half dislocated into the anterior chamber. It appears to me that our knowledge of the normal anatomy of the lens does not account for cleavage in this plane.

Finally, I would call attention to the production of astigmatism by the operation for cataract. This certainly must happen most frequently by flap extraction, but also occurs sometimes in sclerotic extraction. I am convinced that defective sight after good operations depends much more upon this circumstance than has been imagined. It ought not to be so rare as it is to secure V. = 1. And this degree of sight may be attained in cases of iridectomy upward, with just as much certainty as where the pupil remains circular. The ascertainment of astigmatism after extraction is much facilitated by the absence of accommodation. It will be found important not to neglect an error of 1-48 in cases where the best sight is desired, for this will make a difference of one or two degrees of Snellen's table. Of manifest importance is this matter where there may be prolapsus of the iris.

The number of cases operated on is so small that a table of results would not be of much value. First attempts in a new method of operating are of course unsatisfactory. I count four cases of loss of vitreous. I am conscious that greater practice has conferred greater facility. I have met with several, viz., three, cases of suppuration, and the reasons are to be found partly in the very unfavorable character of the patients, partly, I admit, in errors in operating. In six instances there has been sufficient iritis to necessitate iridectomy, and by so doing good sight either was or could be secured.

The number of cases attended by perfect healing and satisfactory sight without secondary operation was eleven; one eye was lost by an injury after the operation.

When my cases shall be more numerous I will tabulate them. As the matter now stands, out of 21 cases 18 may be claimed as successes, although this is not a perfectly fair statement of the matter, in default of more explicit details as to the degree of sight.

Enucleation of Eye for Sympathetic Ophthalmia. By Dr. J. F. Noyes, of Detroit, Michigan.

M. C., æt. thirty years, a miner, in vigorous health, came from the Cliff Mine, Lake Superior, to Detroit, for the treatment of a very painful disease affecting the left eye. Failing to obtain relief by the treatment he had received, he came to me. He stated that in youth he had been wounded in the left eye by a fighting cock, causing severe inflammation, followed by total loss of vision in that eye. From this period he remembered to have suffered no very great pain or discomfort in it until about a year before he consulted me, when the complaint became violent.

I found the eye intensely inflamed, painful, very tender upon pressure, and less in size than the other. The cornea was opaque in nearly every part, and flattened. The iris, as much of it as could be seen, was discolored and deformed, the pupillary border adhering to the crystalline lens, which had a dirty, chalky hue. This condition of the bulb was accompanied by an intolerance of light, and by other strong indications of the presence of active sympathetic affection on the part of the sound one.

In this view of the case, there could be no doubt that the disease had reached a point urgently requiring that a part or the whole of the offending organ should, without delay, be removed, as the best and only safe course of treatment to be pursued. I was not a little in favor of removing only the anterior portion of the eye, as I had done in not dissimilar cases—since this plan would secure a better and more movable cushion for an artificial eye to rest upon; but as such an operation would not exempt the sound eye from sympathetic inflammation, from inflammation or disease arising from the stump thus left behind, enucleation was preferred.

Oct. 5, 1863, the patient having been etherized, the operation was performed. In attempting to transfix the eye with a tenaculum, the bony substance subsequently revealed was encountered. Prof. Graefe, of Berlin, as a means of diagnosis, recommends percussing upon the ball with a hard substance. The eye, being now secured with a pair of claw forceps, the

conjunctiva was incised around a circumference an eighth of an inch from the edge of the cornea. The tendons of the muscles, one after another, raised upon a blunt hook, were snipped off with scissors from the bulb. The optic nerve being severed with a pair of long curved scissors, the eye was lifted out and enucleation completed. Recovery, as usual in such cases, was rapid and complete.

An examination of the enucleated eye furnished the subjoined description. The ball was atrophied; the sclerotica normal externally in appearance; the cornea flattened and nearly opaque; iris discolored and deformed, adhering to the lens; the crystalline lens was in a state of cretaceous degeneration; the aqueous humor had quite disappeared; the vitreous humor disorganized into a dark brown-colored fluid. Back within the eye, adhering to it and extending thence nearly up to the ciliary border of the iris, was a bony formation, rough and irregular on its posterior surface, strewed over with pigment, and some places an eighth of an inch in thickness; a small orifice marked the entrance of the optic nerve; only a trace of the chloroid coat could be discovered.

Dr. B. Joy Jeffries made the following remarks upon the principle of the Thaumatrope. (1868.)

Mr. A. Claudet, F. R. S., about a year ago, reported to the Royal Society a new fact in regard to binocular vision, deduced from the thaumatrope. If we print on each side of a card the alternate letters of a word, and attaching a string to either end twirl it around on its axis, the letters on the two sides of the card, owing to the continued retinal impression, are apparently seen at the same time. This experiment, carried out in a variety of ways—such as a bird on one side and a cage on the other, in which it seems to be—forms a popular scientific toy, called the *thaumatrope*, from two Greek words, meaning "wonder" and "turn."

Mr. Claudet's observation is this: Let us attach the strings by knots at the ends, to prevent their slipping through our holes in the card. Let the two knots be on one side of the card, and now, when we twirl it, the card turns in the axis of the opposite side of the card. Pulling the strings through, of

course, reverses the axis to the other side. With binocular vision the letters on the side away from the observer, *i. e.*, where the knots are, seem further off and more indistinct. Reversing the knots we reverse the phenomenon. Placing our eye fifteen inches from the card, and supposing the thickness of the card to be $\frac{1}{80}$ of an inch, the difference between the distances of the two surfaces of the card is not more than $\frac{1}{1200}$ of the whole distance (fifteen inches). The card I use is about $\frac{1}{60}$ of an inch, making $\frac{1}{900}$ of the whole distance at fifteen inches. Although there is but this minute difference, yet the phenomenon is evidently due to it, as the experiment readily shows, even to an eye not trained to optical experimentation. This is a new fact in binocular vision, and I admit it as such without hesitation. To my eyes, however, the phenomenon is not simply *binocular*, but *monocular* also, although in less degree, as binocular is better than monocular vision. This, with another point I will bring up, seems to me to destroy Mr. Claudet's theory of the cause of the above phenomenon. He says: "The effort to obtain distinct vision and the effort to obtain single vision act in unison, for it is impossible not to admit that the two muscular processes by which both the angle of convergence is directed to the object and the focus of the eyes is adapted to its distance, for the double purpose of having at once single and distinct vision of every object, are two actions necessarily simultaneous and inseparably connected. They are therefore both, each in its way, criteria of the distances of objects; but they give rise to certain indirect and additional criteria for other distances, in two ways: one, the more important, is the double images of the objects situated before and behind the point of convergence; and the other, but only in a subsidiary way, the degree of confusion of the objects situated before and behind the point of convergence, and which are not in focus." This latter, as he says, "being monocular also, should perhaps be left out in considering binocular vision. Therefore it is particularly the sensation of the double images, the degree of their separation and their respective positions, either outside or inside from the centres of the two retinæ, which indicate more powerfully the exact distance of the object from the point of single vision, either before or behind. When

we look fixedly on a point of one surface of the revolving card, that point appears single, and we see at the same time another point on the other surface which appears double, although we hardly feel that we notice its doubleness; and from the position or distribution of the double images, either on the right or on the left of the central point, we have at the same glance the perception of the respective distances. Therefore, to judge of the distances of certain objects in the direction of the line of vision, we are not absolutely obliged to alter constantly the angle of convergence. This is proved by our perception of the two distances of the surfaces of the card while it is revolving; for it would be impossible that we should alter the angle of convergence to adapt it alternately to the two surfaces while they are turning so rapidly. The same angle of convergence kept on one or the other surface is no impediment to our seeing both in a sufficiently distinct manner." The diagram exhibited illustrates this, as Mr. Claudet puts it.

However, I get this effect or difference of plane with one eye, heightened by binocular vision. To me it seems, therefore, that it must depend on accommodation rather than on change of convergence. I admit the intimate relation of these two muscular efforts, though the researches of Prof. Donders and others show that they can be dissociated more than we should gather from Mr. Claudet's remarks. I am aware how much the muscular effort for convergence tells us in regard to distance, to prove which I know of no more striking experiment than that of Meyer (*vide* Archiv für Ophthal., Bd. 2, 1856), with the series of strings in different planes, as I have shown to the Society. But if this effect of the letters, appearing in different planes with the thaumatrope, is a monocular phenomenon, then we do not need Mr. Claudet's explanation in reference to difference of convergence and eccentric double images. I would allow that this might help to produce the effect, were it not that the arc on the retina, subtended by the angle between the lines from the two surfaces of card (that is, $\frac{1}{8}\frac{1}{0}$ apart, and but $\frac{1}{1}\frac{1}{2}\frac{1}{0}\frac{1}{0}$ of whole distance from the eye, fifteen inches), is, as I make by rough calculation, about $\frac{1}{1}\frac{1}{6}\frac{1}{0}\frac{1}{0}$ of a millimetre; and Tobias Meyer, E. H. Weber, Volkman and others agree that two points, *to be seen as such*, must subtend an arc on the

retina from $\frac{2}{1\,0\,0\,0}$ to $\frac{4}{1\,0\,0\,0}$ of a millimetre. Moreover, recent experimentation has shown more and more conclusively the large part accommodation takes in judging of distances within its "range." When I print the alternate letters of a name, for instance, L N O N, on a card, and the others, I C L, on pieces of the card, and paste them between the first, they will vary in distance from my eye just the thickness of the card—in my experiment $\frac{1}{6\,0}$ inch, or $\frac{1}{9\,0\,0}$ of whole distance to my eye, fifteen inches. With the exception of the *alternate presentation* and *after-impression*, this gives me just what I have when the letters are on the two sides of the card and it is twirled by the strings. Yet, placing the letters as above, I get, in but a feeble degree, this effect of difference of plane compared with the thaumatrope experiment. I am not prepared to explain to my own satisfaction this new fact of Mr. Claudet, yet I desire to call attention to what seems a misinterpretation of its cause, as every discovery in binocular vision, now being studied and experimented upon so carefully, should be thoroughly tested by many observers before being admitted as a point of departure for further investigation.

Tests for the Insufficiency of the Recti Interni Muscles.

By E. G. Loring, M.D., of New York. (1868.)

Since Graefe's last paper on muscular asthenopia, which was published in the Archives in 1862, very little has appeared in literature on insufficiency of the interni recti. The methods of examination, the tests for the determination of the degree and the modes of treatment, are essentially the same as those instituted, at this time, by the celebrated author.

These methods, as is well known, are four in number, and consist of the following experiments: first, the gradual approach toward the eye of a small object, which always remains in the median line and a little below the horizontal plane. The second, a modification of the first, consists in interrupting the act of binocular vision by interposing a screen between the object, as it is advanced, and one of the eyes. The third test consists in interrupting binocular single vision by means of prisms. The fourth, in the determination by means of prisms of the adduction and abduction.

In these four tests, or even in the last two alone, we have, to use Graefe's own words, "a completely exhaustive method," not only for the diagnosis of insufficiency of the internal recti, but also for the exact measurement of its degree.

It is for the purpose of ascertaining whether this statement is correct that I propose to ask your attention to a brief consideration of the tests upon which the above assertion is founded.

The first test depends on the fact that normal eyes, on the average, are enabled by the power resident in the interni recti muscles to make the visual axes intersect each other in the median line at three inches distance from the eye. Eyes which cannot do this are supposed to be deficient in converging power. The deficiency shows itself, as does all other muscular insufficiency, by a relaxation, either partial or complete, of the pre-existing tension. This must take place, in regard to the interni, as soon as the distance at which the object is situated demands a degree of convergence greater than that which the force of the interni can acquire. The overtasked muscle then relaxes and the eye deviates outward. Graefe himself characterizes this as the coarsest and least to be depended upon of all the above mentioned tests. To a certain extent this is true, for there are undoubtedly many cases of insufficiency of which this test would not give the slightest indication. Still, when the deviation does occur at the usual distance for near work, or even a little within it, this is one of the most reliable of all tests, affording as it does conclusive proof of muscular insufficiency, and offering, under ordinary circumstances, the surest indications for the preference of tenotomy over other methods of treatment.

There are several conditions which may affect the accuracy of this test, but as all these are incident to the second, which in itself is but a modification of the first, they will be, in order to avoid repetition, considered under that heading.

The second test, that of interposing a screen while the object is made to approach the eyes, is considered by Graefe as much more delicate and therefore more efficient than the preceding.

The principle on which it acts lies in the fact that as soon

as the act of binocular vision is interrupted, the necessity for any undue muscular effort, by which binocular vision was obtained, is also removed, the eye then assuming that degree of convergence which can be obtained without undue effort, or, in other words, assuming a position where the equilibrium between the interni and externi is perfect.

In estimating the value of this test, two principal questions arise. First, does the fact that one of the eyes deviates behind the screen necessitate the conclusion that an abnormal amount of tension had previously existed for a given degree of convergence? Second, cannot such undue tension exist without such deviation?

In regard to the first question, no one who has been in the habit of accurately determining the refraction and the condition of the muscular apparatus of all cases of eye disease which present themselves, can have failed to notice that a deviation of one eye will often occur as soon as this is covered by a screen, while notwithstanding the patient is not only free from all asthenopic symptoms, but when also no insufficiency can be brought forth by the tests now in vogue. As corroborative of this, which I am aware is at variance with the recognized opinion, and for the sake of brevity, I beg leave to refer to an example.

A young man of robust health presented himself at our office with a slight conjunctival affection in one eye. Being aware that such troubles are often due to faulty refraction or muscular insufficiency, an examination was made as to both these conditions. The refraction was found to be emmetropic, and the accommodation was good. As soon, however, as a screen was placed before one eye, while the object was gradually approached to 6″ or 8″, the eye which was covered immediately fell out to a considerable degree. So conspicuous was this that I at once imagined that insufficiency of the interni was the cause of the conjunctival trouble. On questioning the patient, who was at the time in college, occupying a high position in his class, I found that, though compelled to do a large amount of close work daily, he had never till the present time had the slightest trouble, nor did he now complain of any asthenopic symptoms whatever. On this account I was

led to examine the conditions of the muscle more closely. The patient was able to converge with apparent ease and maintain the convergence up to three inches from the eye. The test with the prism and the vertical line with a dot was employed. The double images produced by the prism were in the same axial line, and remained so, even when the card was moved up to the patient's nearest point of binocular vision. A lighted candle with the colored glass was then substituted, and with the same result. The power of the muscles was then examined, and the adduction and abduction were found to be of normal proportions, and the equilibrium between the muscles, for all degrees of convergence, perfect.

After a short time the patient presented himself entirely relieved of the conjunctival affection; the eye, however, still deviated behind the screen, yet no insufficiency could be called forth. Dr. Agnew then made an independent examination, remarking, without any suggestion on my part, the above mentioned peculiarity. Several months after I again saw the patient, and the conditions were exactly the same, though he had long been free from any trouble in his eyes.

I have seen many similar cases, but have only cited the above as an example.

Why some normal eyes, showing normal muscular force, will deviate behind a screen to a very perceptible or even considerable degree, I will leave to further consideration. Of the fact, however, I am fully convinced.

In regard to the second question, that insufficiency may exist and yet no deviation take place behind the screen, it will be sufficient to state that all authorities agree that it can. It was on account of this fact that Graefe proposed the two last methods of examination.

There are one or two conditions which would seem to have a tendency to prevent the deviation, which, I think, are worthy of more consideration than has been usually accorded to them, the most important of which conditions is the state of the accommodation.

The intimate connection between convergence and accommodation has long been known, and, in my remarks yesterday, I endeavored to establish the principle that for every degree

of increased tension on the ciliary muscle there was also increased tension on the interni. Now if, in a given case, the accommodation is so much reduced that it can only be adjusted for a near object by an undue effort, this undue muscular tension on the part of the ciliary muscle is then also shared in by the interni, and thus the visual axes are forced to maintain the required degree of convergence, and no deviation can occur so long as the object is seen distinctly. As the demand on the ciliary muscle is greater in hypermetropia and presbyopia than in other conditions, it is precisely here that this resistance to deviation would be most marked. As is well known, the proportion between the amount of muscular power held in reserve and that actually used by hypermetropic eyes decreases as the object approaches the eye, so that in the neighborhood of the binocular near point (itself generally removed unnaturally from the eye) the tension on the ciliary muscle is very near or even at its maximum. Now, under such conditions, if the interni are normally strong, the moment one eye is covered the tendency is for this eye to turn in, sometimes even to a considerable degree, showing that, at the same time that the ciliary muscle was making undue efforts, the interni were also. Now allowing the same conditions to exist, except that the interni, instead of being normally strong, are to a certain degree insufficient in power, then the same increased tension will be demanded of the ciliary muscle and propagated to the interni in both cases, only what was sufficient, under normally strong interni, to make the eye deviate inward, in the case of the weakened ones will be only sufficient to maintain the given degree of convergence; or it may be not enough for this, and the covered eye will then deviate to a trifling degree outward, but not enough to lead to the supposition of any abnormal insufficiency. Thus an insufficiency in muscular force in hypermetropic eyes may exist which may be capable of producing asthenopic symptoms, when the occupation is maintained for a certain time, which may, however, be entirely masked, for the moment of examination, even when the object is brought within the customary point for near work. At the present moment a remarkable example of this occurs to me.

A patient with well marked asthenopic symptoms presented

himself. Hm. was found to equal 1-18, V. = 1; A. somewhat limited. If a pencil was advanced in the median line, while one eye was covered with a screen, as soon as the pencil had approached to 16″ (the patient's point of near work) the covered eye deviated behind the screen in a marked degree. If, however, the pencil was carried to 8″ instead of 16, no deviation took place. If it was moved still nearer, say 4 inches, the eye which in the first place had deviated outward, finally turned inward; so that, under the effect of increased accommodative efforts, what was, in the first place, latent divergent became latent convergent strabismus. These facts were corroborated in a subsequent examination by Dr. Agnew. The same phenomena occur in presbyopic patients, and I see no reason why they should not even in emmetropia, where the demands on the accommodation, from any cause, such as debility or paresis, were excessive.

In hypermetropic patients it is, for this reason, better to neutralize the hypermetropia before attempting to determine the condition of the muscles, and to do this always at the point ordinarily chosen for near work; otherwise a large amount of insufficiency may remain concealed.

The effect of accommodative efforts is also not without importance upon the insufficiency of myopes. The difference between the degree of deviation when the myopia is neutralized by glasses, thus compelling some accommodative efforts for the near, and when it is not, is oftentimes very marked; and I cannot help thinking that the important service which suitable glasses may be made to give toward preventing that tendency to deviation which myopic eyes often show, has been much overlooked, or at least underrated—a tendency which has its origin, especially in young persons, as much in a desire to remove as much as possible the far point by an entire relaxation of the accommodation by means of decreased convergence, as in any inherent weakness of the interni muscles themselves. It is certainly as far from the natural order of things for myopes to use a maximum amount of convergence, with a minimum of accommodation, as it is for hypermetropes to use a large amount of accommodation under small degrees of convergence.

Since, then, an eye may deviate behind the screen when no want of muscular power can be proved to exist, and, on the other hand, insufficiency may be shown to be present, and yet no deviation occur, it would seem to follow that this test is not sufficiently reliable to meet all the demands for a correct diagnosis; while, from the fact that it is extremely difficult to measure accurately with the eye trifling deviations, Graefe has proposed the two last tests mentioned above, which he has characterized as "infinitely better and, in regard to diagnosis, entirely exhaustive."

The first of these tests is the well known one of double images, produced by interrupting binocular single seeing by means of prisms. The nature of the test and the manner in which it is employed are so familiar to all as to render an explanation of them superfluous on my part. The principle on which it acts depends on the alleged fact that so soon as the act of binocular single vision is interrupted, voluntary control over the muscles governing the visual act is lost, and the eyes are then at liberty to follow the natural muscular tendency, which they do by assuming a position at which the muscular equilibrium is perfect. If, then, in order to obtain and maintain a certain degree of convergence, a patient is using undue muscular efforts, it follows that such efforts must cease as soon as the power to make them is removed. The only question then is, does the test really remove and completely remove the ability to bring into action any excess of muscular force, over and above that which is represented by a perfect equilibrium between the externi and interni recti muscles, which all agree ought to be considered the normal condition for all degrees of convergence? If the test fail to do this completely, or even in part, it is manifest that the term "completely exhaustive" cannot justly be applied to it. While admiring in the highest degree the great ingenuity and beauty of the test, as well as its efficiency as a rule, I cannot help believing that more exceptions as to its infallibility exist than we should be led to suppose from the representations of one whose views on ophthalmic science are now universally and justly looked upon almost as laws.

That the interruption of binocular single vision does not

necessarily remove the control over the muscles governing the visual act, can be readily demonstrated.

If I place a prism over one eye in the manner suggested by Graefe, while the card, with a line having a dot in its centre, is placed before me in the median line, I then obtain the appearance of two dots on one line, the dots remaining in exactly the same position from any distance up to the nearest point of binocular vision. This proves, according to Graefe's law, a perfect equilibrium between the external and internal recti. If the card is then held at 12 inches from the eye, the two dots still remaining on one line, I can, by voluntarily relaxing the tension on the interni, obtain crossed images at once, the two lines, each with a dot in the centre, being separated laterally to a considerable distance (as measured by prisms 35°). By exercising a slight voluntary effort, I can then make the secondary image (that proceeding from the deviating eye) gradually approach the primary (that of the fixing eye), till the two blend together, giving the appearance, with which we started, of two dots on one line. By a little further exercise of muscular force, I can make the secondary image pass to the other side of the primary, thus obtaining at will either crossed or homonymous images, or, in other words, a perfect equilibrium, an insufficiency, or a preponderance of muscular force in the interni, thus proving that the control over the muscles governing the visual act is not *necessarily* removed by interrupting the act of binocular single vision. If the control over the muscles remains in one case, notwithstanding the test for preventing it, why may it not in others? Why may not that voluntarily called forth excess of muscular contraction which enabled me to produce homonymous images, or increased convergence, be called forth by another in maintaining a right intersection of the visual axes, especially as this latter is a normal condition, produced and maintained by strong intuitive instigations, while the former is an abnormal condition produced in spite of such instigations? Why could not undue efforts at muscular contraction be put forth by weak interni as well as by strong, this effort being capable of just maintaining, in the one case, an exact equilibrium; in the other, of producing a preponderance of muscular tension?

But it may be alleged that this faculty has been acquired by practice, so that the tension on the interni can be varied at will, just as that of the ciliary muscle can be voluntarily increased or lessened. In my own case it may be the result of practice, but I have seen patients endowed with the same power.

As an example of this, as well as an illustration of some other important points, I beg leave to call your attention to the following briefly stated case.

A middle-aged gentleman visited us with the complaint that for several years he had suffered a great deal of pain in his head, accompanied with a gradually increasing disability to use his eyes. An examination revealed a large amount of insufficiency of the internal recti. The pain and inconvenience which he suffered were consequently referred to this cause, as his eyes seemed otherwise perfectly normal. Two things, however, militated against this opinion: one was that the pain in his head had existed a long time previous to the affection of the eyes; the other was that, from boyhood, the patient had been able to "see double" at will, unaccompanied, however, by any inconvenience for near work; while at the same time, although the insufficiency called forth by the usual tests was very great (18° for the far, 32° for the near), still the degree of convergence which the patient could maintain was fully equal to the normal amount, the interni not yielding when the object was approached even to four inches.

As, after a careful examination, no other symptom of cerebral or spinal trouble could be detected than the pain above alluded to, the opinion was advanced that the cause of the patient's inability to use his eyes, as well as the great pain in the head, was to be referred to the weakened condition of the interni recti muscles. As there was, however, some doubt in regard to the matter, it was thought advisable that the patient's general health, which was somewhat reduced at the time, should be recruited before resort was had to an operation. A pair of strong prisms was, however, given to him for near work. After traveling for six months the patient returned, his general health being much improved, but the same trouble still existing in the eyes, though he said he had experienced

some relief from the prisms. Another examination showed the condition of the interni to be about the same as had the previous ones. The externus of the left eye was now divided. Three days after the operation the insufficiency had sunk from 18° to 7° for 20 feet, from 32° to 10° for twelve inches. A week later the right externus was cut, and the subsequent examination showed that only 2° remained for 20 feet, while the patient could hold the two images in the same axial line, from this distance up to his binocular near point.

The patient then made a visit to Philadelphia, and while there, at our instigation, saw Dr. Dyer. Dr. Dyer's examination, made only one month after ours, revealed 15° of insufficiency for twenty feet, and 20° for twelve inches. Surprised at the discrepancy between Dr. Dyer's examination and my own, I then made another, and found that the patient could hold the two images in the same vertical axis from 20 feet to 4 inches; that he could not only hold them so indefinitely at 20 feet, but could even produce homonymous images equal to a prism of 10°; while, on the other hand, he could by a voluntary effort produce a divergence of the visual axes equal to a prism of 16°. This explained the difference between Dr. Dyer's examination and my own. At 12 inches the patient could produce at will either crossed or homonymous images. In other words, he seemed to have perfect control over the muscles governing the common act of vision, notwithstanding the fact that binocular single vision had been interrupted by means of a prism.

The first question which now arises is, can a person who can call forth homonymous images of considerable degree (under a prism angle up or down) at 12 inches, and whose adduction from that point amounts to nearly 40°, and whose abduction only to 24°—can such a person suffer from insufficiency, and are we justified in further operative interference, even if crossed images can be produced of 20° for the near, especially as an exhaustive examination revealed the fact that, notwithstanding an apparently normal amount of total abduction still remained, the power of the left externus had been considerably impaired? A morbidly candid person might ask still another question, and that is, was any operative interfer-

ence at all necessary, notwithstanding the fact that 18° for the far and 32° for the near of insufficiency could be produced? The question is saved at least from being ridiculous by the fact that the condition of the eyes and head, after two operations, was but little if at all improved.

In estimating the value and correctness of Graefe's test the facts attending the determination of the degree of the insufficiency are of great importance, as they assist us in determining whether the control over the muscles governing the common visual act ceases when binocular single vision is interrupted. The amount of insufficiency is, as is well known, measured by that prism which, with its base inward, brings the two images, separated laterally, into the same vertical axial line. If the prism which does this amounts to 5, 10 or 15 degrees, we say that there is an insufficiency of 5°, 10° or 15°.

The question which now arises is, is it true that that prism which reduces crossed images to the same vertical line expresses the amount, and the whole amount, of the insufficiency? I think not, and my reasons for so thinking will be better understood and more briefly given by an example.

Suppose a person suffering from asthenopia to have crossed images which are reduced to vertical by a prism of 6°, base inward. With the help of such a prism we have restored the want of power previously existing, and have thus rendered the eye, apparently at least, equal to a normal eye, in which the equilibrium between the interni and externi is perfect. If now the equilibrium *is* perfect (and that it is so is claimed from the fact that the two images remain in the same axial line), then, if we add any more prisms with the base inward, we shall destroy the equilibrium, and the images which remained vertical under the first prism will then become homonymous as soon as the other prism is added, or, in other words, as soon as the insufficiency is over-corrected. This, it is true, is often the case, but it is by no means the rule; for we often find that, even after we have brought the images from being crossed into the same vertical line, we can go on adding prisms, sometimes those of a considerable degree, and yet the images remain exactly over each other, instead of becoming homonymous, as would be naturally inferred from the principles of the

test. If the first prism, that which brought the images into the same axial line, corrected the insufficiency, why did not those which were subsequently added over-correct it? Suppose to the 6° which brought the images vertical we added successively a prism of 2, 3, 4 degrees before the images left the same vertical axial line—that is, began to grow homonymous—the original prism amounted to 6°, the sum of those added to 9°; now is the insufficiency only 6°, or is it in reality 6°+9° or 15°; or, in other words, are we to consider the weakest prism which will produce, or the strongest one under which the images remain, vertical, as the true measurement of the degree of insufficiency?

I have been in the habit of looking upon this gradual yielding of the interni under prisms as latent muscular force strongly analogous to that incident to the ciliary muscle in hypermetropia, and have hence applied the term of latent insufficiency to that degree of prism which can be added (without rendering the images homonymous) over and above the degree which renders crossed images vertical. I cannot see why that which takes place with the ciliary muscle should not also occur with the interni, nor understand why these latter might not, like the former, refuse to relax suddenly, of their own accord, a certain amount of tension, to the exercise of which they have become accustomed. I have been led to this view from the frequency in which this so-called latent insufficiency occurs, and from the predominance which it assumes, in many cases, over what, in contradistinction, may be called the actual insufficiency. It varies in degree just as the actual does, and often amounts to double, sometimes to even three times the latter, and may even exist to a considerable degree where no actual can be brought forth.

Extended as these remarks are, I cannot forbear citing one or two examples of this, which I consider an important physiological point. Two well marked cases of asthenopia presented themselves. A careful examination under atropine failed to reveal the slightest cause for it. When subjected to Graefe's test the two dots remained on one line up to the binocular near point. The same result followed with the candle and colored glass. This would prove, according to Graefe, a

perfect equilibrium between the externi and interni muscles. If, however, in addition to the prism placed angle upward a second prism was added, with the base inward, the images still remained in the same vertical axial line, and did not become homonymous, as would be naturally supposed, till the angles of the prisms added in the one case amounted to 16°, in the other to the enormous amount of 24°.

It seems to me that such cases, of which the above are but examples, place us in a dilemma in regard to the accurate and easy diagnosis of insufficiency. In the above cases there either was, or was not, insufficiency. If there was, why did not the test show it? If there was no insufficiency, and the equilibrium of the muscles was perfect, how does it happen that a prism of 24° can be added without destroying this equilibrium? It can only happen in one way, and that is by the exercise of muscular tension by the patient proportionate to the degree of the prism added; but it is precisely this exercise which the test claims to prevent, and upon which its only virtue as a test depends.

I have called your attention to this matter of latent insufficiency because I have thought that its existence might explain some points of practical importance. Might not the reason why, after having corrected a certain amount of insufficiency by means of prisms, we find later that the amount of insufficiency has increased, depend upon the fact that the interni under the influence of the glasses have relaxed a certain amount of their tension, so that a certain degree of insufficiency which had previously been latent has become manifest, just as in the case of the ciliary muscle what had been latent becomes under glasses manifest hypermetropia? May not this also hold good in regard to tenotomy, and explain to a certain extent the difference in the effect which we gain by an operation?

As evidence of the existence of what I have, in the foregoing remarks, called latent insufficiency, I have only my own observation to offer, as I have never seen any allusion to the matter, though such may exist.

The fourth test, which is, in fact, but the complement of the preceding, consists in determining, by means of prisms, the amount of adduction and abduction, or, in other words, the

amount of muscular force resident in the interni and externi recti muscles. This amount of adduction and abduction is measured by the strongest prism, which, with its angle respectively inward and outward, can be overcome without destroying binocular single vision. The absolute amount of this muscular force varies so much in normal eyes that little dependence can be placed upon it as a criterion of the actually existing muscular power; but when taken in connection with the other tests it offers valuable assistance in determining the necessity for, or at least the limits of, operative interference. All of which is, however, so clearly and fully laid down in the paper so frequently quoted in these remarks as to make further comment here superfluous.

There are, however, one or two conditions which influence the amount of muscular force as obtained by prisms, which might, if not properly taken into consideration, lead to erroneous results.

As is known, the proportion in emmetropic eyes between the adduction and abduction is, for average distances, as 3 is to 2. As, however, we approach the binocular near point the abduction rises, till it either equals or surpasses the adduction. While in non-squinting hypermetropic eyes we often find that, in the immediate neighborhood of, or even at, the nearest point of binocular vision, there is no adductive force at all, while at the ordinary point for near work there is an absolute insufficiency of the externi which shows itself the minute the colored glass is placed over one eye, by homonymous images, and this, too, oftentimes without binocular single vision being interrupted by a prism with the angle upward or downward.

This fact led Giraud-Teulon to express the belief that there was the same inherent tendency in hypermetropic eyes toward weak externi that there was in myopic eyes toward weak interni. Be this as it may, there is no doubt about the fact that non-squinting hypermetropic eyes, as a rule, show a want of abductive force, the *original* cause of which I believe to be closely connected with the accommodation.

This want of abductive power may be either actual or apparent. If actual, it depends on some want of power in the muscles themselves, and may be occasioned in three principal ways.

(1) Through an abnormal preponderance of either volume or force of the interni over the externi recti muscles, which may in themselves be below the normal standard. This condition is generally inherited from parents who have themselves squinted, and in whom the interni have become, from constant exercise, unduly developed, while the externi, on the other hand, from want of use and from being constantly stretched, have lost both volume and vigor.

(2) From faulty insertion of the muscles.

(3) From a state of debility, either temporary or permanent, which has been developed by a constant straining on the part of the externi in order to maintain binocular vision while the eye is using accommodative efforts for the purpose of neutralizing the error of refraction. It is evident that in these cases, where there is inherent weakness in the externi, that the correction of the error in refraction, though it may give some relief, will not remove the whole cause of the trouble; and this is one of the reasons why some hypermetropes, even when provided with suitable glasses, still continue to suffer from asthenopia.

Instead, however, of being actual, this insufficiency of abductive force may be only *apparent*. When it is so it is due entirely to the efforts of the accommodation to overcome the error in refraction, and disappears as soon as this is corrected by glasses. This will be rendered clearer by an example. A patient has Hm. = 1-16; Ht., as estimated by the ophthalmoscope, between 1-12 and 1-10. If the condition of the muscles is examined at twelve inches from the eye without neutralizing the hypermetropia, the amount of adduction equals a prism of 20°, while the abduction amounts only to 4°. But if the error of refraction is corrected, then the amount of abduction rises from 4° to 15°, while the adduction, in this particular case, undergoes but little change. It is, as a rule, however, decreased.

This shows that the disproportionately low force of abduction was due, in this and similar cases, not to any idiopathic weakness of the muscles themselves, but to the fact that the nervous influence, by which the ciliary muscle is able to overcome the error of refraction, is propagated to the interni,

which thus throws the balance of power in their favor, and gives them, so long as accommodative efforts are going on, the preponderance of force. From which it follows that the tension on the interni can only be relaxed by relaxing that of the ciliary muscle. This, as a rule, the unaided eye refuses to do, for the reason that distinct vision would have to be given up. When, however, the hypermetropia is completely neutralized the undue tension on the ciliary muscle is removed, and, as a consequence, that on the interni. The abnormal resistance which these latter offer to the action of the externi is thus removed, and these muscles are then left at liberty to bring forth their power in order to maintain binocular single vision, as soon as this is threatened by prisms being placed before the eyes with the angle outward.

It often happens that the effect of glasses in increasing, at least to its fullest degree, the abductive force in hypermetropic eyes, is not always obtained at once, even in cases where the externi are not idiopathically weak. It often takes some little time for the eyes to give up the exercise of a certain amount of tension, the employment of which habit has rendered intuitive.

The above is also applicable to presbyopia, or in fact to any other condition which necessitates undue accommodative efforts.

It will be seen that, in the above remarks, some doubt has been expressed, not so much as to the merits, as to the infallibility of the tests now in use, and I hope that it will be understood that even this has been done in no captious spirit, or for the purpose of underrating the benefits which patient perseverance as well as deep scientific knowledge have already bestowed upon us, but simply with the view of calling attention to a subject which, from the abuse of eyes now universally prevalent, is daily becoming, at least in this country, a matter of increasing importance.

On the Cause of Anæsthesia of the Cornea and Radiating Fibres of the Iris, without Intraocular Tension.

By Jos. G. Hildreth, M.D., Chicago.

At the last annual session of the Society I read a report of some observations upon this subject.

Subsequent experience has confirmed the views therein set forth—that a certain pathological condition of the ciliary ring, or some part thereof, so depresses the functions of the nervous element of the cornea as to produce in that membrane a state of anæsthesia, and also at the same time correspondingly to lessen the normal dilatability of the pupil. Further, that this particular state of the ciliary ring, the coexisting keratic anæsthesia and diminution of pupillary expansibility, are not caused by or dependent upon intraocular pressure.

As one of the disposing causes in some forms of keratic disease, as the forerunner of corneal disintegration and disorganization in purulent ophthalmia, as elucidating the beneficial action of atropia in affections of the cornea, and by causing lesion of nutrition in parts specially involved, as a complication which adds to the uncertainty of success in the operation of extraction of cataract, this subject becomes a matter of practical importance.

Abundant clinical observation has demonstrated that these corneal and iritic disturbances result from disorder in the ciliary ring. The following cases evidence that it is not dependent upon intraocular tension.

M., age 18. September, 1866. Right eye. Cornea hazy, having an appearance like that of ground glass; it is also so anæsthetized that when firmly touched by the "point of a small twisted roll of unsized paper" the patient is barely conscious of it. The pupil is contracted, and very slightly affected by light and shade. No other appreciable change in the iris; no inflammation in or about the orbit or paralysis of any part can be detected. The most careful tactile essay fails to discover intraocular tension.

A few drops of a four (the last three times, a ten) grain solution of atropia are instilled within the lids at intervals of fifteen minutes for two hours, when the pupil is found to have

dilated a little. At the close of another hour it has not increased. The cornea remains very nearly as fully anæsthetized as before, the contact of the same point of paper producing only a slight tickling sensation.

Paracentesis of the anterior chamber is now made, and the aqueous humor thoroughly evacuated. The operation is followed by a stinging pain at point of puncture for about five minutes. Careful testing then shows no decisive change in cornea; if not as fully anæsthetized as before, the difference is barely appreciable. Again tested in twenty minutes, the globe yet quite soft, when the same grade of anæsthesia exists.

The ciliary ring is now divided from the anterior to its posterior limit.

Between one and two minutes after the cornea is tested, and found so fully sensitive to touch as to be apparently free from anæsthesia.

The next day the pupil is well dilated, though no atropia has been employed since one hour before the operation.

This eye was under observation for over six months. While the pupil was kept largely dilated the cornea remained quite free from anæsthesia; but when the pupil contracted a slight grade of corneal anæsthesia returned.

This experiment was frequently repeated, and with similar results. But after a few months' treatment, the cornea remained equally sensitive whether the pupil was dilated or contracted.

The only local applications, beside atropia, were a red precipitate, and toward the close a yellow amorphous oxide of mercury ointment. No general treatment beside a small quantity of iodide of potassium at commencement.

April, 1867. Pupil is round, normally sensitive to light and shade, and fully susceptible to atropia. The cornea is quite clear and entirely free from anæsthesia.

Accommodation excellent, equaling one-fourth. Clear and distinct perception of No. XX. Dyer's letters at twenty feet; peripheric vision good. Neither the ophthalmoscope nor the phosphenes detect injury to any part of the retina.

A. G., age 24. During an attack of purulent ophthalmia the following occurred.

Nov. 11th, 1866. Right eye. Pupil, heretofore susceptible to atropia, is now undilatable beyond a slight degree. The cornea, for the first time, is somewhat anæsthetical, especially near the lower border, but remains perfectly transparent.

Nov. 12th. The pupil is not further dilated. Corneal anæsthesia has increased in degree.

Nov. 13th. Pupil remains as before. Anæsthesia has increased, especially in the lower parts of the cornea, where, near the periphery, is observed a slight and quite limited disturbance of its transparency.

Nov. 14th. Pupil continues undilatable, and anæsthesia of the cornea is more decided. A superficial ulceration occupies the point of disturbed transparency of yesterday, while the latter has considerably extended.

Nov. 15th. Condition of the pupil the same. Anæsthesia of the cornea is more marked. Its whole surface is hazy, the ulceration is deeper, and surrounding parts are more disordered.

Nov. 16th. The anterior chamber is empty, the ulceration having perforated and adjacent parts commenced to slough. The remainder of the cornea has a cloudy look and is quite anæsthetized, except near the upper border, where sensitiveness to touch is also largely diminished. Pupil contracted.

Nov. 17th. The ulceration has enlarged, and extensive sloughing is threatened. The remainder of the cornea has become quite cloudy, and is anæsthetized to such a degree that all sensitiveness is lost, except a little at the superior margin. It is evident that general disorganization of this membrane is approaching. The aqueous humor constantly escaping, the globe remains soft. Pupil contracted.

At this stage the ciliary ring is divided from "the anterior border to its posterior limit."

In thirty minutes the cloudy aspect of the cornea, to a great extent, has disappeared; all the epithelial surface has become quite brilliant, except at the seat of actual disorganization, and anæsthesia is largely relieved up to the line of these parts. Sloughing is arrested, and repair commences. The cornea improves until on the fourth day, when the conditions which had rendered an operation necessary begin to return, and by the

seventh day the ulceration is increasing and extensive sloughing threatened. The remainder of the cornea is quite cloudy. It is fully anæsthetized, save at the superior margin, where sensation is very slight. The aqueous humor continuing to flow through the opening in the cornea, the globe remains soft. Pupil undilated.

The ciliary ring is again divided in same manner as before.

Fifteen minutes after, the cloudiness of the cornea is largely removed. The epithelial surface is brilliant, and the whole membrane presents a more favorable aspect. All beyond the disorganized parts is quite free from anæsthesia. From this time sloughing abates, and the reparative process continues. Except where disorganized, the cornea recovers its transparency. There is no return of anæsthesia.

For brevity the details of treatment have been omitted. Suffice it to say, atropia was consistently used, and scarifications of the lids and chemosis were also employed. The patient was ænemic and debilitated.

The first case above cited shows a high grade of corneal insensibility, with great loss of iritic susceptibility to atropia.

Paracentesis of the anterior chamber has little or no influence upon these symptoms.

Division of the ciliary ring then gives immediate and decided relief to the anæsthetized cornea, and allows atropia to influence the iris.

This demonstrates that these peculiar symptoms were not caused by intraocular pressure, but due to a condition of the ciliary ring which its division obviates.

In the second case the action of atropia upon the iris is quite restricted, and the cornea becomes somewhat anæsthetized, yet remains transparent. The anæsthesia increases and transparency is disturbed; solution of continuity follows and advances to perforation; considerable sloughing is imminent. The continual flow of aqueous humor affords no relief to the anæsthetized and disorganizing cornea. Division of the ciliary ring is followed by immediate amelioration of these symptoms. Atropia has little or no action. Corneal anæsthesia returns, and disorganization soon again commences.

Division of the ciliary ring is followed, as before, by imme-

diate abatement of anæsthesia and improvement in the appearance of the cornea. Atropia takes effect; there is no return of unfavorable symptoms and the reparative process continues.

It is evident the corneal anæsthesia and accompanying solution of continuity were not caused by intraocular pressure, for a constant flow of aqueous humor during eight days was accompanied by no relief, except immediately after division of the ciliary ring.

The return of unfavorable symptoms a few days after the first operation was owing to insufficient action of atropia, by which the immediate effect of division of the ciliary ring was not sustained.

The eye being more susceptible to the drug at the time of the second operation, owing to the influence of the first, the beneficial results were sustained.

The action of atropia is necessary to secure the benefits of an operation in these cases.

Further clinical records could be adduced to show that the immediate cause of these disturbances in the cornea and iris is located in the ciliary ring, and not dependent upon intraocular pressure; but observations given in a previous paper and the decisive nature of those just cited seem sufficient.

Pathological and experimental investigations appear to trace the primary cause to the ophthalmic or the gasserian ganglion, and to be mainly due to defective action of the sympathetic element; yet further research is requisite upon this point.

I hope to present this part of the subject in a future paper.

PRACTICAL OBSERVATIONS ON EXTRACTION OF CATARACTS IN ADULTS. By E. WILLIAMS, of Cincinnati, O.

In connection with a statistical report of Modified Linear Extractions I wish to call attention to some of the causes of failure in this operation. In doing so I shall limit myself to those accidents and complications that have actually occurred in my own experience. To make my paper brief several points must be taken for granted.

1st. Extraction, by one method or another, is the only operation in adults which is justfiable by the experience of the present day.

2d. It is to be presumed that the diagnosis and the indications for the operation have been judiciously settled.

3d. That the operation has been performed in a skillful manner and according to the rules laid down by the best authorities.

Beside this I must say that there is an element in the calculation of the results of all surgical operations which no human foresight can always discern or successfully control. This is a predisposition in the constitution or condition of the patient to inflammation and its consequences. While, therefore, *constant* success is *unattainable*, we find that as science progresses and instruments and apparatus are perfected, the percentage of accidents and consequent failures become less and less. Much as the treatment of cataract has been recently studied and improved, still *absolute* success is a *utopian* idea, and we can only strive to approximate it.

Assuming that you are all familiar with the history of extraction in general, I will confine myself to the most recent modifications of the operation and their comparative merits. As Graefe's modified linear extraction is the operation now in almost universal favor, I shall commence with it. His most recent modification of the incision, in which he recommends a slight increase in the *length* and a less perpendicular *direction* of the cut, and thus diminishes the necessity of traction instruments and *changes the point* of external pressure, is, in my judgment, a decided improvement. In varying the length of the incision from four and a half to five lines, according to the size of the nucleus, it is seldom if ever necessary to introduce a scoop or other instrument to bring out the cataract, except in premature escape of vitreous. The facility with which the accouchment of the lens is effected by pressure from below with the scoop, when the preliminary steps have been properly performed, is a constant source of delight. The careful manipulation of the scoop enables one likewise to more completely bring away the soft cortical substance, and thus greatly reduce the risk of subsequent inflammation. While I feel the great importance of clearing the eye as far as possible of all remaining lens substance, I am sure that more or less is left in every eye, as is manifested by its swelling and opacification in the

first few days following the extraction. Some remains adherent to the inner surface of the capsule, and some is often pushed aside behind the iris. Perseverance in endeavors to work out the fragments and completely clear the pupil, before bandaging the eye, without, however, introducing instruments, is highly important. At the same time that gentle rubbing upward through the medium of the lower lid is practiced, I sometimes press very slightly and cautiously on the posterior lip of the wound with the scoop, so as to open it and help them out. If by accident a little vitreous escapes during these efforts, no harm usually results from it. Escape of this fluid before the exit of the lens is always an accident to be deplored. It pushes the cataract away from the incision, necessitates generally the introduction of the scoop with its dangers, causes cortical fragments to be shoved aside and left behind the iris, and protracts the healing process, thus, in all respects, greatly increasing the risks of subsequent inflammation. Beside the immediate dangers from loss of vitreous just mentioned, there is the greater risk of hemorrhage into the eye, subacute choroiditis, detachment of the retina, etc. It cannot be denied that in proportion as you increase the length of the incision and carry it back into the sclerotic you increase the probabilities of loss of vitreous. It is desirable, therefore, to make the opening in each case large enough to allow of the easy escape of the nucleus without traction instruments and without contusion, and yet not so extensive as to lead to loss of vitreous. Every eye and every hand must be educated by experience to judge of the size of the nucleus, and to execute a corresponding incision, instead of depending altogether on rules and lines. When I first began this operation I was prone to make my incision too long, in consequence of the previous habit of flap extractions, including usually nearly or quite one-half of the periphery of the cornea. During that time I had more frequent escape of vitreous than since I have learned to control the size of the incision. As to sloping it more backward, as advised by Graefe and others, so as to form a more decided flap, I do not think it a good suggestion. On the contrary, I now uniformly make my puncture and counter-puncture a little back of the sclero-corneal junction, with the edge of the knife turned slightly forward from

the beginning, thus making the cut more perpendicular, and without rotating the knife in the wound. The turning the edge forward after the counter-puncture makes an irregular notched incision which does not so readily and perfectly coapt. The turning the knife after transfixion necessarily haggles and contuses the parts. Beside this, the rotation of the knife causes the back to press injuriously against the iris and sometimes to rupture the hyaloid and give rise to escape of vitreous. If the knife has a perfect point and edge, and the incision is made complete in one plane with proper care, escape of vitreous is very rare. I finish the incision as near the edge of the cornea as possible, so as to avoid a conjunctival flap, which does little if any good, and is in the way while the subsequent steps are being executed. In the excision of the iris I always make the assistant do it with two successive snips of the scissors. When the one band of iris is clipped I draw toward the other angle and have the rest snipped as closely as possible. This is the most successful way to prevent any strangulation of iris in the angles of the wound. This done, the other steps of the operation are executed as Graefe recommends. I find, too, a great advantage in fixing the eye nearly inward instead of downward and inward, or directly downward as formerly. By seizing it thus, nearly opposite the point of puncture, the puncture and counter-puncture are easier executed, because the rolling of the eye is avoided. The presence of the fixation forceps in this position does not interfere with the use of the scoop below.

I have changed my mind too on the subject of anæsthetics in this operation. I never give them now, except in persons who have little or no self-control, or who refuse to make the trial. The exit of the lens is much facilitated by the co-operation of the patient, and testing the vision can be safely resorted to as soon as the operation is completed. After chloroform vomiting and dangerous restlessness are very apt to be met with, independently of the nervous prostration and derangement of appetite, which, in old people especially, may prove deleterious to the healing process.

The chief causes of failure, in my judgment, consist, first and mainly, in the escape of vitreous. If this occurs *before* the is-

sue of the cataract, the dangers are greatly enhanced. This accident may arise from liquefaction of the vitreous; a faulty incision, especially if it is made long and far back in the sclerotic; undue pressure of the back of the knife against the iris and suspensory ligament; and violent muscular action, especially at the moment of completing the incision. Any one, or all of these combined, may lead to loss of vitreous, lateral displacement of the lens, and the necessity of introducing the scoop. Once the hyaloid is ruptured, more or less flow of vitreous takes place with each subsequent step of the operation. The iridectomy must be made hurriedly and under disadvantages. The use of the cystotome is difficult, and the capsule not likely to be freely and regularly divided. Finally, the scoop must be passed far into the vitreous, to get behind and beyond the lens and bring it away, with perhaps the last and greatest loss of that fluid. The contusion necessarily produced by the scoop in the vitreous, iris, cornea and wound; the scraping off and retention of large masses of cortical lens substance; the collapse and wrinkling of the eye, with imperfect coaptation of the wound, still further kept open by vitreous, all combine to endanger the loss of the eye, either by immediate suppuration or subsequent irido-choroiditis. A second frequent cause of partial or complete failure is retention of cortical substance, even when the hyaloid is not ruptured. If the wound is well adapted, so as to secure healing by first intention, and the iridectomy has been large, no iris left in the angles of the incision, and atropia be freely used, the danger from this cause is not very great. In such a contingency, however, a secondary operation is more likely to be required. I do not fear contusion of the wound by the slow and difficult passage of the lens as much as Steffan and others. If the nucleus can be forced out by external pressure, without the introduction of the scoop and without loss of vitreous, and the pupil well cleared of cortical, a good iridectomy having been made, it is seldom that any serious inflammation ensues. Of course I prefer that the cataract should come out easily, but a too large incision, with prolapsus of vitreous, is more to be deprecated than the slow and difficult passage of the lens through a rather small incision. The smaller the incision compatible

with the successful and complete removal of all the lens substance by external means, the more certain we are of healing by first intention.

With these preliminaries, I beg leave to present a summary of my operations by Graefe's method and their results. In all I have operated on twenty-five patients and twenty-eight eyes, the ages of the subjects ranging from 39 to 76, six being over 70, thirteen over 60, and six below 60. Of the twenty-eight eyes operated twenty-one were so successful that the patients could read No. 1 of Jaeger's or $1\frac{1}{2}$ of Snellen's test types, the glasses required ranging from $+2$ to $+4$, $+2\frac{1}{2}$ being the most common reading glass. Of the other seven eyes, one was lost by panophthalmitis, two by suppurative irido-choroiditis; one has merely sight to walk alone, by glaucomatous inflammation, of which I had great fears before the operation; one from evacuation of the eye by sudden violent straining and springing out of bed while partially under the chloroform. Of the other two, one finally recovered power to read No. 3 of Snellen easily after a secondary operation with iridectomy, and one had chronic iritis with repeated hemorrhages into the anterior chamber, with closure of the pupil. The patient is a feeble woman of 76 years, and the vision was very fair for two weeks. There is a fair chance of improvement by a secondary operation. The panophthalmitis in the one eye was evidently due to previous starvation and exposure to cold. The operation itself succeeded without the least complication, but the patient had an atrophied conjunctiva from chronic trachoma. In another the suppurative iritis was due to irregularity and imperfect coaptation of the incision. The irido-choroiditis in another was due to a previously diseased state of the eye, as indicated by synechia posterior and discoloration of the iris. On making the iridectomy the chamber at once filled with blood and continued to do so. I was obliged to use the cystotome by guess, and bring away the lens with a scoop in the same manner. The other eye of the same patient was perfectly restored by an operation, and is counted among the first class above. The eye in which only vision enough to walk alone was obtained was in a man 74 years old, with chronic glaucoma and flocculi in the vitreous. The operation was, *per*

se, successful, but the eye was not capable of better vision. Leaving out the eye lost by accidental straining of the patient as he partially recovered from the chloroform, and another in an excessively fat, feeble and nervous colored woman, who rolled about as she pleased, tore off the bandage, and did all she could to thwart the result, as cases not fairly to be counted, and we have twenty-one perfect successes, one imperfect, and one still doubtful, in twenty-six eyes. In but one of the twenty-one perfect results was a secondary operation necessary. In the last thirteen operations, made quite recently, without chloroform, all were perfectly successful but one, and that may be improved by a second operation. The twelve successful ones were made in my own private hospital, where I had complete control of the whole management.

In connection with these statistics I will give those of my partner, A. D. Williams, M. D. He has operated on fifteen patients and nineteen eyes, the ages ranging from 31 to 75, but four being below 50 and the great majority over 60 years of age. Of the nineteen eyes, seventeen were perfectly successful, all but two reading $1\frac{1}{2}$, and those No. 3 readily. Of the two failures, one eye, after a protracted healing, attended by frequent and profuse hemorrhages into the anterior chamber, so far recovered that the patient could see to walk and recognize persons. It was lost by hard work in the hot sun of the harvest field. The other failure was in a man 75 years old, who had extreme atrophy of the conjunctiva following badly treated trachoma. One eye had been lost under great and long suffering from a needle operation, and the other had very imperfect perception of light and no phosphenes. We had little hope of success, and there was free escape of vitreous before the lens, in consequence of liquefaction of the vitreous and the accidental puncture of the suspensory ligament with the point of the scissors. Of the other eighteen eyes there was but one partial failure from the patient's own foolish exposure. His success with this operation has been remarkably good. The last five of his successful cases were also operated on in our private clinic house. Of all the cases yet treated there, where we can have all necessary conveniences and control the whole management of the cases, both before and after the operation,

not a single eye has been lost, the whole number being seventeen. This shows the great value of the after-treatment and nursing in securing a good result.

Summing up all the operations made by us, we have forty successes in forty-five eyes; and eliminating the hopeless one of the last nineteen operations, we have forty perfect results in forty-four eyes. Judging from our increased success, the more we acquire facility in making the operation, being in my own hands a loss of one in thirteen, and in my nephew's of one in fifteen, we may reasonably hope to attain still better figures in the future. I do not agree with von Hasner in believing that von Graefe would have had equally brilliant results if he had stuck to the old flap operation and perfected his manual dexterity, as in modified linear extraction. Still, constant and long continued experience in making any given operation does greatly enhance the results.

Remarks.—In our practice the two most frequent accidents have been escape of vitreous and hemorrhage into the anterior chamber. In our forty-five eyes we have had loss of vitreous in only five, three before the exit of the lens and two after. In the recent operations its frequency has much diminished. In the earlier operations hemorrhage into the anterior chamber, occurring variously from the first to the tenth day after the extraction, were frequent—the period of greatest liability to this occurrence being from the second to the fifth day—and it was often repeated several times at intervals of twelve to twenty-four hours. This accident is most common in very old patients, but may happen in any case. In one of mine it took place two weeks after the operation. The amount of the blood varies from a slight trace in the bottom of the chamber to complete filling of that space. In one patient, a man of 66, a hemorrhage came on in the night of the fifth day, which filled the chamber, ruptured the wound, spread extensively under the conjunctiva, and escaped in sufficient quantity to stain the lint and bandage through and through. Still he recovered very fair vision, being able to read No. 3. While it is, therefore, not a very serious accident, it is one that usually causes some temporary pain, clouds the vision for a few days, protracts the cure and discourages the patient. Recently, since I enter the

knife with the edge turned a little forward, and cut out in or near the edge of the cornea, both loss of vitreous and secondary hemorrhage are more rare.

In conclusion, I must say that I am pleased with my experience in this operation. It has afforded me much better results than the corneal flap extraction, or even the modifications recommended by Mooren and Jacobson. Were it possible in all cases to bring out the lens *inclosed in its capsule*, through a sclerotic incision, without loss of vitreous or other serious violence to the eye, subsequent accidents would be extremely rare, and success almost certain. But this never can be done unless in exceptional cases. The labors of Pagenstecher, Wecker and others in this direction have given very good statistics, but all agree in confining its application to certain cases of senile cataract, while the modified linear is applicable to all.

I have just received a pamphlet on what is called *Querextraction*, in cataract of adults, by Dr. H. Küchler, of Darmstadt, with a report of twenty-eight cases. He makes the incision in the horizontal meridian of the cornea, the puncture and counter-puncture being in the sclero-corneal junction, and the back of the knife backward. He closes with *thirty-three aphorisms* on his peculiar method, the last of which I translate as follows: "The central meridional extraction, executed in this way, solves the problem of the extraction of cataracts in adults, in the simplest, easiest and most certain and natural way." This sounds *cheering*, but the *operation*, with the *aphorisms*, is too much for one dose, and I fear the operator may not live to see its general adoption.

On a Color Test for Astigmatism. By John Green, M.D., of St. Louis, Missouri.

Any of the ordinary tests for ametropia and astigmatism may be printed in colored ink, upon a white or black ground, and used in the same way as those printed in black and white. The attempt has also been made to combine two primary colors in the same diagram, in the expectation that ametropia or astigmatism would be revealed by the production of the compound color made up of the two primary colors.[1] Experiments of this kind have failed to produce useful tests, although the occasional utility of a method based upon the power of accurately defining colors is obvious. The cause of this failure seems to lie in the fact that the experiments have been tried with opaque pigments, or with colored inks applied to opaque cards, and it was only by making trial of transparent colors of great purity and brilliancy, illuminated by transmitted light, that I have succeeded in attaining results at all satisfactory. The best material for these tests seems to be thin paper, dyed of the requisite shades and rendered nearly transparent by saturating it with clear white varnish or Canada balsam. The colors with which I have been most successful are carmine red and ultramarine blue. The red paper is best prepared by dyeing thin tissue or copying paper in an ammoniacal solution of carmine, and smoothing it by pressure while still slightly damp. When perfectly dry, it is cut into strips or sections, according to the form of the diagram to be made, and mounted upon a plate of glass or a stretched piece of thin white muslin, and varnished. Blue tissue paper of pretty good color may be purchased, but I have obtained a better tint by the employment of the finest ultramarine ground in oil and thinned with clear white varnish. This is applied with a soft brush to paper previously prepared by saturating it with the same white varnish. When dry, the transparent blue paper is cut to the desired form and mounted with the red upon the glass or muslin. A single coat of varnish upon the muslin back will increase the transparency of the diagram, if desired.[2] The

[1] Dr. E. Dyer, in Transactions of American Ophthalmological Society for 1865.

[2] Equally good results may doubtless be attained by painting, in transpar-

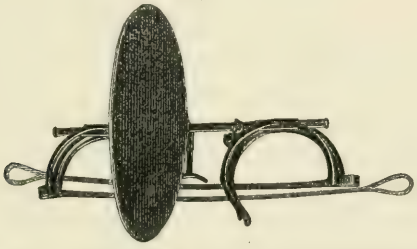
test cards thus prepared are hung in a window (not in the direct sunlight) and viewed from the opposite side of the room. The difference in tint observed in the different lines in cases of even very low grades of astigmatism is well marked, and will often attract the attention of persons whose appreciation of form and whose conception of distinct definition in the visual act is inferior to their power of appreciating and discriminating color. The form of diagram which I have found most satisfactory is made up of twelve radiating lines of a diameter corresponding to No. C. of Snelling test-types. [Plate IV.]

On a New System of Tests for the Detection and Measurement of Astigmatism, with an Analysis of Sixty-four Cases of Refractive Anomalies observed by the aid of this Method. By John Green, M.D., of St. Louis, Mo.

This method is proposed in the belief that by it the investigation of astigmatism is so far simplified as to admit of its detection, and at least approximate estimation, as a part of every determination of the refractive condition of the eye.

The tests are designed to be used in the same manner as the *letterproeven* of Snellen, and are drawn upon the same scales. The printed diagrams should be hung upon the wall, in a good light, at a distance of fifteen or twenty feet from the eye to be examined. The transparent tests are intended to be hung in a window, but not in the direct sunshine.

Fig. 1.



The eyes are to be tested one at a time, shading the eye not under examination by means of the small movable screen, shown

ent varnish, colors upon ground glass, and it is very probable that the whole diagram might be printed in colors, from wood-cuts, upon paper thin enough to be made transparent by varnishing.

in Fig. 1, in connection with Nachet's trial spectacle-frame. The especial advantage of this arrangement consists in the facility with which, by slightly turning the screen to one side or the other, either eye at will may be excluded from participating in the visual act, and that without the disturbance of accommodative adjustment which attends the closing or actual covering of one eye.

Before entering upon the examination for astigmatism, it is well to ascertain approximately, by the use of Snellen's test-types, both the degree of visual acuteness and the existence or non-existence of myopia or hypermetropia.

The eye may next be directed to the radiating triple lines upon the dial card (Plate I.), and the question asked whether any one of the twelve sets of lines is distinctly seen. If myopia or hypermetropia is present the eye is now to be carefully corrected by placing before it the weakest concave or the strongest convex glass compatible with perfect vision of *any one* set of lines. If, now, in these trials with different glasses, all the lines appear uniformly and equally distinct, we may conclude that astigmatism is absent; if, on the other hand, this preliminary examination reveals a marked difference in the distinctness of the lines lying in different meridians, we know that we are dealing with a case of irregular refraction, and may proceed at once to investigate it as a case of astigmatism. [In this stage of the examination additional diagrams, like those shown in Plate II., 1, 2, 3 and 4, Plate III., 3, 4 and 5, and in Plate I., 2, are often very useful, by enabling us to repeat, almost indefinitely, the same questions, without wearying the patient by appearing to do so. Some of these, being drawn upon a larger scale, are also better suited to the first tests in cases of the higher grades of astigmatism with corresponding deficiency of visual acuteness.]

Having determined the fact of astigmatism, the next step is to ascertain the direction of the meridian of least refraction. This is easily measured by the aid of the diagrams, shown in Plate II., 5 and 6. Using these cards, we now proceed to select the *strongest convex* or the *weakest concave* glass through which any one line or sector of the diagram can be distinctly seen. The meridian thus found will be that of *least* refraction,

and the correcting glass selected will be the measure of any ametropia which may be present in this meridian.

It now remains to measure the difference in the refractive power of the eye in its principal meridians of least and greatest refraction, or, in other words, to measure the degree of the astigmatism. For this purpose the cards shown in Plate III., 1, 2 and 6, are employed, turning the two sets of lines in the direction of the two principal meridians and testing the vision by means of *concave cylindrical* glasses. The *weakest* glass which, in connection with the spherical glass already selected, will suffice to render equally distinct the two sets of lines, or which, failing in that, affords the maximum degree of distinctness in the meridian of greatest refraction, will be the measure of the degree of the astigmatism.

From the data now in our possession we may easily calculate the correcting glass to be prescribed. If the case is one of positive astigmatism, with or without myopia (Am, or M+Am), this glass will be the one already selected, and will be either a simple concave cylindric glass or a concave cylindric combined with a concave spherical glass: in the other forms (Ah, H+Ah, and Ahm) we have a combination of a concave cylindric with a convex spherical glass, which it is almost always advisable to reduce to a simpler form by an easy arithmetical calculation.

These tests are substantially the same as have already been described by me in papers published in the American Journal of the Medical Sciences for January, 1867, and in the Seventh Annual Report of the Netherlands Ophthalmic Hospital, at Utrecht, for 1866.

The dial (Plate I.) is mounted on a card of thick pasteboard about fourteen inches square, and is provided with a central pivot on which the circular cards (Plate II., and Plate III., 1 and 2) may be hung and turned in any desired direction. The divisions in the circumference of the inner circle are of five degrees (5°) each, while the spaces between successive hours on the dial are equal each to thirty degrees (30°). Plate III., 3, 4, 5 and 6, represents perforated disks, punched from black card-board or thin metal, and covered upon the back with translucent white paper. These cards are designed to be hung

in a window so as to be viewed by transmitted light; they should not, however, be hung in the direct sunlight. Any desired inclination may be given to the lines and rows of holes by varying the point of suspension of the card. This is effected by means of the small holes figured at the upper part of each disk. Plate I., 2, shows an arrangement, in a linear series, of sets of parallel lines similar to those figured on the dial, the dots at the upper edge of the card representing holes for suspension as in the punched disks.

The system which I have adopted for designating the angle of inclination of the meridian of greatest curvature is to call the vertical line (that is, the XII. and VI. of the clock) zero, and to count off the number of degrees of inclination upon the right hand of XII., up to 90°, with the *plus* (+) sign, and upon the left hand with the *minus* (−) sign. By this plan the important and very interesting fact of symmetry or asymmetry in the two eyes is distinctly shown.

I have found these tests extremely delicate, and am able with them easily to detect and measure degrees of astigmatism as low as one-hundredth (1-100), or even lower, in persons of good visual power and fair intelligence. By their habitual employment in investigating the refractive condition of the eye I have been led to some interesting results, of which an analysis is here given.

Analysis of Sixty-Four (64) Cases of Refractive Anomalies. — [This number includes all the cases of refractive anomalies examined by me during the two years ending July 21st, 1868, excluding only such low grades of ametropia or astigmatism as were less than one-sixtieth (1-60) in the worse eye.]

Hypermetropia simple	11
Hypermetropia with astigmatism	18
Simple negative astigmatism	1
Myopia simple	5
Myopia with astigmatism	22
Simple positive astigmatism	2
Mixed astigmatism	3
Aphakia with astigmatism	2
Total	64

Percentage of astigmatism to total of refractive anomalies, 75.

Percentage of astigmatism in cases of deficient refraction (H, H + Ah, and Ah), 63.

Percentage of astigmatism in cases of excessive refraction (M, M + Am, and Am), 83.

TABLE I.—SHOWING THE ELEMENTS OF FORTY-EIGHT (48) CASES OF ASTIGMATISM.

RIGHT EYE.				LEFT EYE.		
Number of Case.	Astigmatism.	Ametropia.	Angle of Mo.	Astigmatism.	Ametropia.	Angle of Mo.
1....	Ah. 1-60	Hm. 1-24	90°	Ah. 1-30	Hm. 1-18	— 84°
2....	Am. 1-30	M. 1-11	+ 12°	Am. 1-36	M. 1-9	0°
3....	Ah. 1-36	Hm. 1-60	0°	Ah. 1-30	Hm. 1-60	0°
4....	Am. 1-60	M. 1-96	+ 50°		M. 1-72	
5....	Ah. 1-30	Hm. 1-8	+ 15°	Ah. 1-42	Hm. 1-8	— 15°
6....		Ht. 1-48		Ah. 1-24	Ht. 1-36	+ 15°
7....	Am. 1-24	M. 1-30	90°	Am. 1-36	M. 1-16	+ 54°
8....	Ah. 1-48	Hm. 1-60	0°	Ah. 1-42	Hm. 1-60	— 15°
9....	Am. 1-60	M. 1-13	— 60°	Am. 1-36	M. 1-13	— 30°
10....		Hm. 1-7		Ah. 1-30	Hm. 1-7	0°
11....	Am. 1-8		— 78°	Emmetropic.		
12....	Am. 1-60		0°	Am. 1-36		0°
13....	Am. 1-30	M. 1-24	— 45°	Am. 1-10	M. 1-24	+ 45°
14....	Ah. 1-60	Hm. 1-84	+ 6°	Ah. 1-60	Hm. 1-140	0°
15....	Vision very defective.			Ah. 1-30	Hm. 1-9	+ 35°
16....	Am. 1-8	M. 1-20	+ 50°	Am. 1-15	M. 1-60	— 78°
17....	Am. 1-48	M. 1-8	— 60°	Am. 1-36	M. 1-7½	— 5°
18....	Ah. 1-12	Ht. 1-4½	0°	Ah. 1-15	Ht. 1-4	— 24°
19....	Am. 1-60	M. 1-20	— 30°	Am. 1-42	M. 1-16	+ 12°
20....	Am. 1-30	M. 1-11	+ 60°	Am. 1-60	M. 1-9	+ 54°
21....	Am. 1-60	M. 1-6	90°	Am. 1-60	M. 1-6	+ 60°
22....	Am. 1-60	M. 1-60	— 30°	(Am. 1-84, Ah. 1-37 = Ahm. 1-24)		— 52°
23....		Hm. 1-13		Ah. 1-60	Hm. 1-12	— 30°
24....		Hm. 1-36		Ah. 1-48	Hm. 1-96	0°
25....	Emmetropic.			Am. 1-60, Ah. 1-30 = Ahm. 1-20		+ 80°
26....	Ah. 1-30	Ht. 1-84	+ 5°	Ah. 1-24	Ht. 1-84	— 5°
27....	Ah. 1-60		— 30°	Ah. 1-15	Hm. 1-24	90°
28....	Am. 1-20	M. 1-5	— 5°	Am. 1-36	M. 1-5⅜	0°
29....	Ah. 1-60		— 15°	Ah. 1-60		+ 15°
30....		M. 1-5		Am. 1-36	M. 1-5	+ 30°
31....	Ah. 1-11	Ht. 1-20	0°	Ah. 1-12	Ht. 1-20	+ 25°
32....	Ah. 1-24	Hm. 1-8	— 75°	Vision very defective.		
33....		M. 1-5		Am. 1-20	M. 1-7	— 15°
34....	Ah. 1-60	Hm. 1-140	+ 18°	Ah. 1-60	Hm. 1-240	+ 9°
35....	Am. 1-60	M. 1-4½	— 67°	Am. 1-48	M. 1-5	+ 5°
36....	Ah. 1-48	Hm. 1-144	— 36°	Ah. 1-60	Hm. 1-15	90°
37....	Am. 1-60	M. 1-30	— 75°		M. 1-20	
38....	Am. 1-24	M. 1-2¼	— 48°	Am. 1-20	M. 1-2½	+ 48°
39....	Am. 1-9		+ 12°	Am. 1-60	M. 1-72	+ 12°
40....	(Am. 1-19, Ah. 1-72 = Amh. 1-15)		— 25°	Am. 1-18		+ 30°
41....	Am. 1-60	M. 1-5	— 60°	Am. 1-48	M. 1-5	+ 48°
42....	Ah. 1-10	Hm. 1-24	+ 12°	Ah. 1-10	Hm. 1-90	— 12°
43....	Am. 1-42	M. 1-16	0°	Am. 1-30	M. 1-10	0°
44....	Ah. 1-60	Hm. 1-15	90°	Ah. 1-60	Hm. 1-15	90°
45....	Am. 1-120	M. 1-60	+ 60°	Am. 1-60	M. 1-48	— 72°
46....	Am. 1-10		0°	Am. 1-30	M. 1-7	+ 10°
47....	Ah. 1-18	Ht. 1-4	— 36°	Ah. 1-15	Ht. 1-4	+ 45°
48....	Am. 1-10	M. 1-16	— 15°	Am. 1-7	M. 1-72	— 15°

From these statistics we may fairly infer, first, that astigmatism is a very frequent complication of the simpler forms of ametropia; and, secondly, that it occurs as frequently, and in as high degrees, in connection with myopia as with hypermetropia. The degree of astigmatism in the cases of hypermetropia with astigmatism (H+Ah), and of myopia with astigmatism (M+Am), equaled, in the worse eye:

		M + Am	H + Ah	CASES.
1-7	in	1	..	1
1-8	"	1	..	1
1-9	"	1	..	1
1-10	"	2	1	3
1-11	"	..	1	1
1-15	"	..	1	1
1-20	"	2	..	2
1-24	"	1	3	4
1-30	"	3	5	8
1-36	"	4	..	4
1-42	"	1	1	2
1-48	"	2	2	4
1-60	"	4	4	8
		22	18	40

In simple negative astigmatism (Ah) the degree of astigmatism equaled, in the worse eye:

1-60 ..... in ..... 1 case.

In simple positive astigmatism (Am) the degree of astigmatism in the worse eye equaled:

1-8 ..... in ..... 1 case.
1-36 ..... " ..... 1 "

In the three cases of mixed astigmatism (Ahm or Amh) the degree of astigmatism in the worse eye equaled:

1-15 ..... in ..... 1 case.
1-20 ..... " ..... 1 "
1-24 ..... " ..... 1 "

In the two cases of aphakia with astigmatism the degree of astigmatism equaled:

O D	O S		
1-12	1-15	in	1 case.
1-18	1-15	"	1 "

TABLE II.—SHOWING THE DEGREE OF ASTIGMATISM IN THE TWO EYES IN FORTY-SIX (46) CASES IN WHICH THE REFRACTIVE CONDITION OF BOTH EYES COULD BE DETERMINED.

RIGHT EYE.			LEFT EYE.		
Number of Case.	Form of As.	Degree of As.	Degree of As.	Form of As.	Remarks.
48....	M. + Am.	1-10	1-7	M. + Am.	
16....	M. + Am.	1-8	1-15	M. + Am.	
11....	Am.	1-8	0	Em.	
39....	Am.	1-9	1-60	M. + Am.	
42....	H. + Ah.	1-10	1-10	H. + Ah.	
46....	Am.	1-10	1-30	M. + Am.	
13....	M. + Am.	1-30	1-10	M. + Am.	
31....	H. + Ah.	1-11	1-12	H. + Ah.	
18....	H. + Ah.	1-12	1-15	H. + Ah.	Aphakia.
40....	Amh.	1-15	1-18	Am.	
47....	H. + Ah.	1-18	1-15	H. + Ah.	Aphakia.
27....	Ah.	1-60	1-15	H. + Ah.	
38....	M. + Am.	1-24	1-20	M. + Am.	
28....	M. + Am.	1-20	1-36	M. + Am.	
33....	M.	0	1-20	M. + Am.	
25....	Em.	0	1-20	Ahm.	
26....	H. + Ah.	1-30	1-24	H. + Ah.	
7....	M. + Am.	1-24	1-36	M. + Am.	
22....	M. + Am.	1-60	1-24	Ahm.	
6....	H.	0	1-24	H. + Ah.	
2....	M. + Am.	1-30	1-36	M. + Am.	
3....	H. + Ah.	1-36	1-30	H. + Ah.	
5....	H. + Ah.	1-30	1-42	H. + Ah.	
43....	M. + Am.	1-42	1-30	M. + Am.	
20 ...	M. + Am	1-30	1-60	M. + Am.	
1....	H + Ah.	1-60	1-30	H + Ah.	
10 ...	H.	0	1-30	H. + Ah.	
17....	M. + Am.	1-48	1-36	M. + Am.	
9 ...	M + Am.	1-60	1-36	M. + Am.	
12....	Am.	1-60	1-36	Am.	
30....	M.	0	1-36	M. + Am.	
8....	H. + Ah.	1-48	1-42	H. + Ah.	
19....	M. + Am.	1-60	1-42	M. + Am.	
36....	H. + Ah.	1-48	1-60	H. + Ah.	
35....	M. + Am.	1-60	1-48	M. + Am.	
41....	M. + Am.	1-60	1-48	M. + Am.	
24....	H.	0	1-48	H. + Ah.	
21....	M. + Am.	1-60	1-60	M. + Am.	
29....	Ah.	1-60	1-60	Ah.	
34....	H. + Ah.	1-60	1-60	H. + Ah.	
44....	H. + Ah.	1-60	1-60	H. + Ah.	
14....	H. + Ah.	1-60	1-60	H. + Ah.	
45....	M. + Am.	1-120	1-60	M. + Am.	
37....	M. + Am.	1-60	0	M.	
23....	H.	0	1-60	H + Ah.	
4....	M. + Am.	1-60	0	M.	

By inspection of this table we note that of forty-six (46) cases of astigmatism, in which the refractive condition of both eyes was determined, it occurred:

In the *right* only, the
other being emmetropic.....in 1 case;
In the *right* eye only, the
other being ametropic .....in 2 cases;
In the *left* eye only, the
other being emmetropic.....in 6 cases;
In the *left* eye only, the
other being ametropic .....in 1 case;
In *both* eyes..... in 36 cases.

Total..... 46

Of the thirty-six cases of astigmatism occurring in both eyes it equaled, in the two eyes:

O D	O S			Difference.
1-10	1-7	in	1 case.	1-23
1-8	1-15	"	1 "	1-17
1-9	1-60	"	1 "	1-11
1-10	1-10	"	1 "	0
1-10	1-30	"	1 "	1-15
1-30	1-10	"	1 "	1-15
1-11	1-12	"	1 "	1-132
1-12	1-15	"	1 "	1-60
1-15	1-18	"	1 "	1-90
1-18	1-15	"	1 "	1-90
1-60	1-15	"	1 "	1-20
1-24	1-20	"	1 "	1-120
1-20	1-36	"	1 "	1-45
1-30	1-24	"	1 "	1-90
1-24	1-36	"	1 "	1-72
1-60	1-24	"	1 "	1-40
1-30	1-36	"	1 "	1-180
1-36	1-30	"	1 "	1-180
1-30	1-42	"	1 "	1-112
1-42	1-30	"	1 "	1-112
1-30	1-60	"	1 "	1-60
1-60	1-30	"	1 "	1-60
1-48	1-36	"	1 "	1-144
1-60	1-36	"	2 cases.	1-90
1-48	1-42	"	1 case.	1-336
1-60	1-42	"	1 "	1-140
1-48	1-60	"	1 "	1-240
1-60	1-48	"	2 cases.	1-240
1-60	1-60	"	5 "	0
1-120	1-60	"	1 case.	1-120

Total.....36

From this list it would appear that in six cases out of thirty-six the degree of astigmatism was the same in the two eyes. It will be noted, however, that of these six cases five are given as of one-sixtieth (1-60) for each eye, which is the lowest grade of which I have ordinarily taken account. This entry, therefore, includes cases in which there was an appreciable degree of astigmatism in both eyes, but in which the de-

termination is accurate for the worse eye only. If, then, we exclude the cases of one-sixtieth (1-60) or less, we have left thirty cases, with but one case of astigmatism of absolutely equal degree in the two eyes. In this case (No. 42) the direction of the principal meridians was also symmetrical.

TABLE III.—SHOWING THE ANGLE OF INCLINATION OF THE MERIDIAN OF GREATEST REFRACTION (REFERRED TO THE VERTICAL) IN FORTY-SIX (46) CASES OF ASTIGMATISM.

No. of Case.	Right Eye.	Left Eye.	Mean Inclination	
10.....	.....	0°	.....	Monocular.
24.....	.....	0°	.....	"
6.....	.....	+15°	.....	"
33.....	.....	−15°	.....	"
23.	.....	−30°	.....	"
30.....	.....	+30°	.....	"
4.....	+50°	.....	.....	"
37.	−75°	.....	.....	"
11.....	−78°	.....	.....	"
25.....	.....	+80°	.....	"
3.....	0°	0°	0°	Symmetrical.
12.....	0°	0°	0°	"
43.....	0°	0°	0°	"
26.....	+ 5°	− 5°	0°	"
42.....	+12°	−12°	0°	"
5.....	+15°	−15°	0°	"
29.....	−15°	+15°	0°	"
13.....	−45°	+45°	0°	"
38.....	−48°	+48°	0°	"
44... ...	90°	90°	0°	"
28.....	− 5°	0°	− 2½°	Unsymmetrical.
40.....	−25°	+30°	+ 2½°	"
14.....	+ 6°	0°	+ 3°	"
1	90°	−84°	3°	"
22.....	−30°	−52°	+ 4°	"
47.....	−36°	+45°	+ 4½°	"
46.....	0°	+10°	+ 5°	"
41.....	−60°	+48°	− 6°	"
45.	+60°	−72°	− 6°	"
2.....	+12°	0°	+ 6°	"
8. ...	0°	−15°	− 7½°	"
19.....	−30°	+12°	− 9°	"
18.....	0°	−24°	−12°	"
39.....	+12°	+12°	+12°	"
31... ...	0°	+25°	+12½°	"
34.....	+18°	+ 9°	+13½°	"
16.....	+50°	−78°	−14°	"
48.	−15°	−15°	−15°	"
21.....	90°	+60°	15°	"
7.....	90°	+54°	18°	"
36.....	−36°	90°	27°	"
27.....	−30°	90°	30°	"
35.....	−67°	+ 5°	−31°	"
17.....	−60°	− 5°	−32½°	"
9.....	−60°	−30°	−45°	"
20.....	+60°	+54°	+57°	".

By inspection of this table we note that, of thirty-six (36) cases of astigmatism occurring in both eyes, the direction of the meridian of greatest refraction was *symmetrical* in the two eyes in ten (10) cases, while in the remaining twenty-six (26) cases are to be found all possible degrees of deviation from the law of symmetry. We note also the considerable proportion of astigmatic eyes (22 out 84, or 26 per cent.) in which the principal meridians are vertical and horizontal, and the small number of cases (4 out of 48, or 8 per cent.) in which this is true of both eyes. In fifteen (15) of the twenty-two (22) eyes, in which the principal meridians were vertical and horizontal, the meridian of greatest refraction was the vertical, in seven (7) it was horizontal. Of the remaining sixty-two (62) eyes the inclination to the vertical of the meridian of greatest refraction was less than forty-five degrees (45°) in thirty-eight (38) eyes, and more than forty-five degrees (45°) in twenty-one (21) eyes; in three (3) eyes it equaled forty-five degrees (45°). Of the whole number, then, the meridian of greatest refraction approached nearest the vertical in fifty-three (53) eyes, or sixty-three (63) per cent.; in twenty-eight (28) eyes, or thirty-three (33) per cent., it approached most nearly to the horizontal.

Results of Treatment.—The results of treatment by cylindrical glasses varied very greatly in different cases, even when it was certain that the optical defect was accurately corrected. Some of the best results attained were in the higher grades of astigmatism, showing that in other cases, in which less improvement was observed, the eyes were otherwise defective. This accords with the experience of Donders, who considers astigmatism as a form of defective development of the eye, and therefore a defect which is likely often to occur in connection with other defects, and which is, in fact, very frequently associated with hypermetropia; that it often occurs, also, in connection with a predisposition to myopia is proved by the large number of cases in which I have found it coexisting with that defect. In a case of ametropia with astigmatism, I expect, by patient investigation of the case, to attain as good a visual result as if it were a case of simple ametropia; and in a case of simple astigmatism, I look upon the failure to attain a substantially perfect result as evidence of some defect other than a

regular refractive anomaly. A few selected cases will serve to illustrate these opinions.

Case 39.—Positive astigmatism (Am) of 1-9 in right eye; positive astigmatism of 1-60 with myopia of 1-72 (M + Am) of the left eye.

O D, Am = 1-9, Mo + 12°, V = 15-20.
O S, Am = 1-60, M = 1-72, Mo + 12°, V = 15-20.

In this case a very high degree of astigmatism in the right eye was associated with a very low grade in the left. The eyes were both perfect, however, in other respects, and the result was equally perfect vision with the two eyes.

Case 46.—Positive astigmatism (Am) of 1-10 in right eye; positive astigmatism of 1-30 with myopia of 1-7 (M + Am) in left eye.

O D, Am = 1-10, Mo 0°, V = 16-20, nearly.
O S, Am = 1-30, M = 1-7, Mo + 10°, V = 16-20.

This case, like the preceding, illustrates an almost equally perfect result in two eyes originally very different.

Case 11.—Simple positive astigmatism (Am) of right eye.

O D, Am = 1-8, Mo — 78°, V. = 16-15.
O S, Emmetropic, V = 16-12.

Case 18.—Astigmatism of both eyes in a case of aphakia from flap extraction (lower section, with suture) one year before examination.

O D, Ah = 1-12, Ht = 1-4½, Mo 0°, V = 16-15.
O S, Ah = 1-15, Ht = 1-4, Mo — 24°, V. = 16-15.

Case 31.—Negative astigmatism with moderate hypermetropia of both eyes (H + Ah)

O D, Ah = 1-11, Ht = 1-20, Mo 0°, V = 16-20, nearly.
O S, Ah = 1-12, Ht = 1-20, Mo + 25°, V = 16-70.

This case was investigated with great care, and the examination several times repeated. The elements of the astigmatism were determined in the left eye by the aid of the coarser diagrams and by the transparent test-cards. The different results obtained in the two eyes are clearly due to a marked defect in the left eye, independent of the astigmatism which was nearly equal and associated with the same degree of hypermetropia in the two eyes.

Case 48.—Positive astigmatism of 1-10 with myopia of 1-16 (M + Am) in the right eye; positive astigmatism of 1-7 with myopia of 1-72 (M + Am) in left eye.

O D, Am = 1-10, M = 1-16, M_o — 15°, V = 15-100.
O S, Am = 1-7, M = 1-72, M_o — 15°, V = 15-20, nearly.

This was a case of visible distortion of the cornea, apparently the result of old inflammation. The eye in which the higher degree of astigmatism existed gave by far the best result after the correction of the refractive defect.

Case 16.—Case of conical cornea of both eyes, in which the visual defect was in part reducible to regular positive astigmatism with myopia (M + Am), admitting of great benefit from its correction by spherico-cylindrical glasses.

O D, Am = 1-8, M = 1-20, M_o + 50°, V = 16-45.
O S, Am = 1-15, M = 1-60, M_o — 78°, V = 16-35.

The effect of the spherico-cylindrical glasses in this case was very decided; the acuteness of vision (V), which with the naked eye was but 16-200, and 16-100 with the two eyes, was raised to 16-45 and 16-35 respectively.

Case 40. — Mixed astigmatism (Amh) of one eye, simple positive astigmatism (Am) of the other.

O D, Am = 1-19, Ah = 1-72 (Amh = 1-15), M_o — 25°, V = 16-20.
O S, Am = 1-18, M_o + 30°, V = 16-20.

The improvement of vision in this case was from 16-70 to 16-20 for the right eye, and from 16-40 to 16-20 for the left eye.

TABLE IV.—VISUAL RESULTS ATTAINED BY THE TRIAL OF CYLINDRICAL AND SPHERICO-CYLINDRICAL GLASSES IN EIGHTEEN (18) CASES OF ASTIGMATISM OF 1-24 OR MORE IN THE WORSE EYE.

	RIGHT EYE.			LEFT EYE.			
No. of Case.	Form of Ast.	Degree.	V.=	Form of Ast.	Degree.	V.=	Remarks.
7	M. + Am.	1-24	16-20 +	M. + Am.	1-36	16-20 +	
11	Am.	1-8	16-15	Emmetropic.		16-12	
13	M. + Am.	1-30	16-20 +	M. + Am.	1-10	16-20 +	
16	M. + Am.	1-8	16-45	M. + Am.	1-15	16-35	Con'l cornea.
18	H. + Ah.	1-12	16-15	H. + Ah.	1-15	16-15	Aphakia from Ext'n.
25	Emmetropic.			Ahm.	1-20	16-15	
26	H. + Ah.	1-30	16-15	H. + Ah.	1-24	16-15	Examin'd under atropia.
27	Ah.	1-60	16-15	H. + Ah.	1-15	16-20	
28	M. + Am.	1-20	16-20	M. + Am.	1-36	16-20	
31	H. + Ah.	1-11	16-20 —	H. + Ah.	1-12	16-70	
32	H. + Ah.	1-24	16-12	Defective.			
33	M.		16-20	M. + Am.	1-20	16-20	
39	Am.	1-9	15-20	M. + Am.	1-60	15-20	
40	Amh.	1-15	16-20 —	Am.	1-18	16-20	
42	H. + Ah.	1-10	16-20 —	H. + Ah.	1-10	16-20 —	
46	Am.	1-10	16-20 —	M. + Am.	1-30	16-20	
47	H. + Ah.	1-18	16-20	H. + Ah.	1-15	16-15	Aphakia from Ext'n.
48	M. + Am.	1-10	15-100	M. + Am.	1-7	15-20 —	Distortion of cornea from old inflam'n.

NOTE.—This list includes all the cases contained in Table I. in which the astigmatism was of as high a grade as 1-24, with the exception of cases 22 and 38, of which the record is imperfect. Case 22 was one in which the correction was very good, as shown by reading No. 1 of Jaeger at ten inches; case 38 was complicated by myopia, requiring correcting glasses of 2¼-inches focus, and the result, as remembered, was very satisfactory in view of the excessive myopia. It has not been thought worth the while to tabulate the results in the lower grades of astigmatism, inasmuch as it may be assumed that, in the absence of other defects, perfect vision will always be attained.

PLATE I.

Fig. 1.

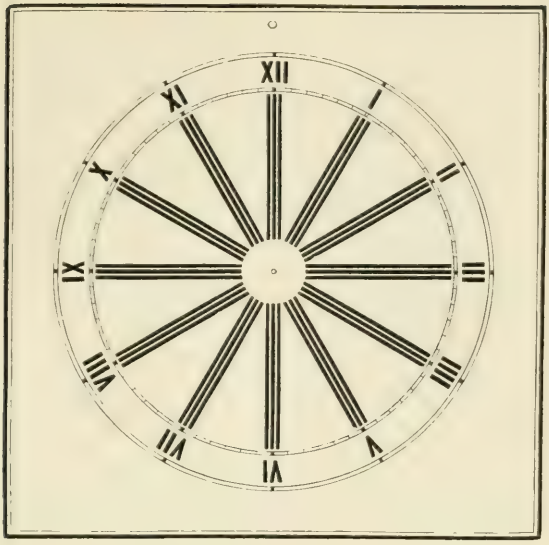
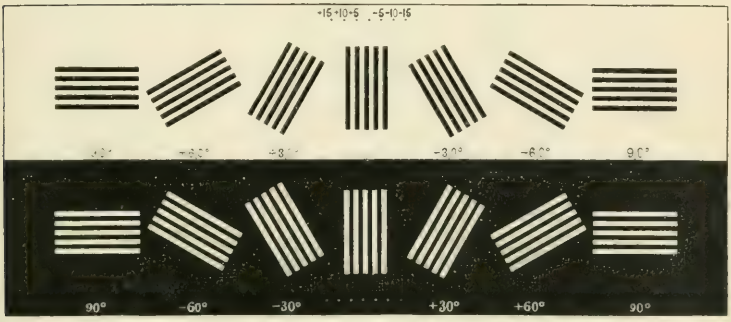


Fig. 2.



Erratum.—Page 71, note, for "Plate IV." read "Plate I., Fig. 2."

PLATE II.

Fig. 1.

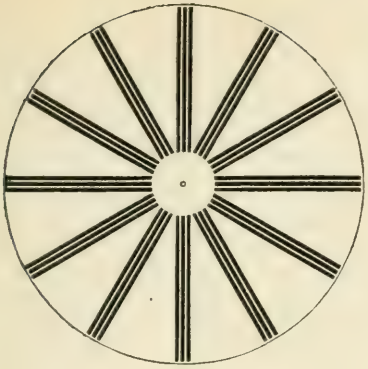


Fig. 2.

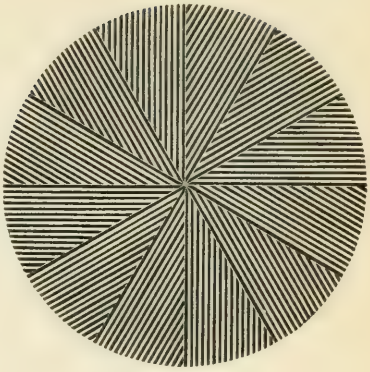


Fig. 3.

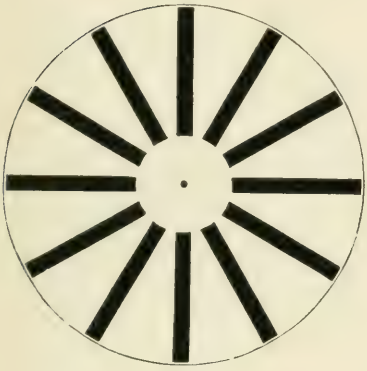


Fig. 4.

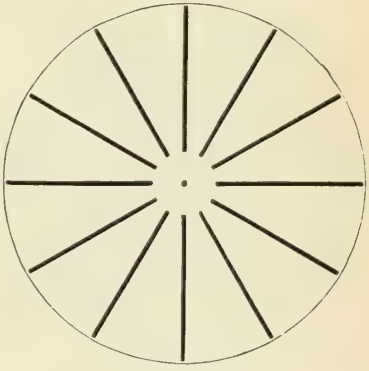


Fig. 5.

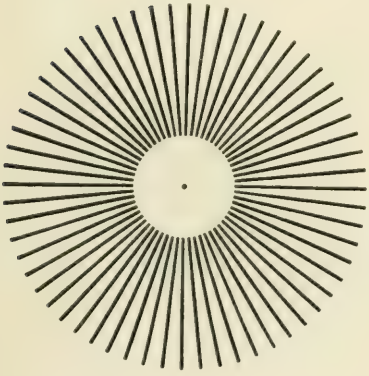


Fig. 6.

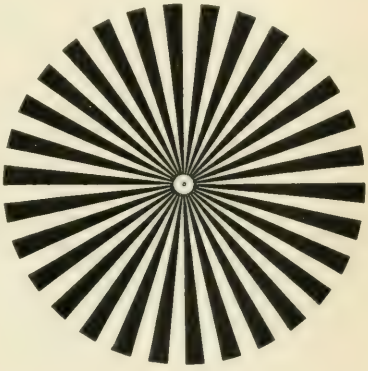


PLATE III.

Fig. 1.

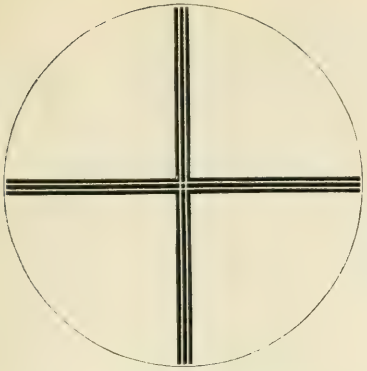


Fig. 2.

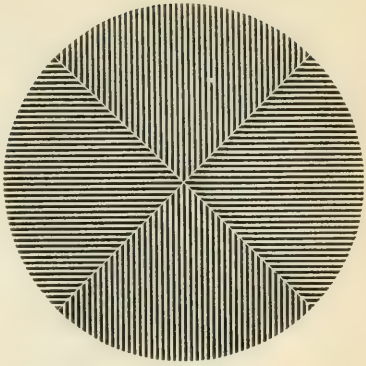


Fig. 3.

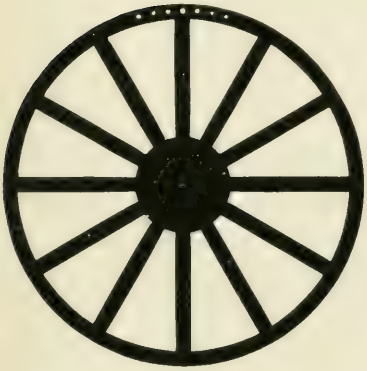


Fig. 4.

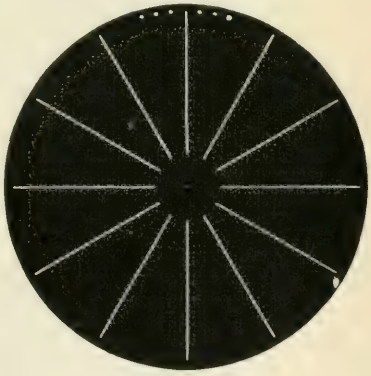


Fig. 5.

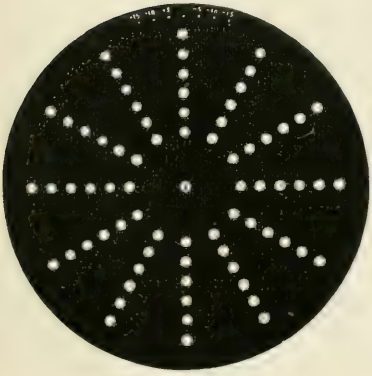


Fig. 6.

PLATE IV.

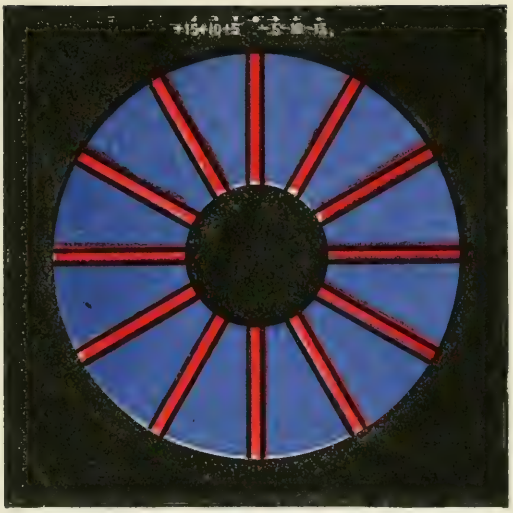


Fig.1.

Fig.2.

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H C F D T G E O
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L F C T C H D E O U P
D T C U O F L P H E G
H C E D L U O P T G F
T C H U O L E P C F D
E C L C T P D F O H U
F C E O H C P U T D L

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Dr. Russell Murdoch	Baltimore,	Maryland.
Dr. Homer G. Newton	Brooklyn,	New York.
Dr. Henry D. Noyes	New York,	" "
Dr. J. F. Noyes	Detroit,	Michigan.
Dr. O. D. Pomeroy	New York,	New York.
Dr. Orestes M. Pray*	Brooklyn,	" "
Dr. J. S. Prout	"	" "
Dr. Charles E. Rider	Rochester,	" "
Dr. C. A. Robertson	Albany,	" "
Dr. D. B. St. John Roosa	New York,	" "
Dr. Henry B. Sands	" "	" "

* Deceased.

Dr. W. W. Seely	Cincinnati,	Ohio.
Dr. Henry L. Shaw	Boston,	Massachusetts.
Dr. Francis Simrock	New York,	New York.
Dr. Francis P. Sprague	Boston,	Massachusetts.
Dr. O. F. Wadsworth	"	"
Dr. Robert Watts	New York,	New York.
Dr. A. D. Williams	Cincinnati,	Ohio.
Dr. E. Williams	"	"
Dr. Henry W. Williams	Boston,	Massachusetts.
Total		43

HONORARY MEMBERS.

Dr. G. A. Bethune	Boston,	Massachusetts.
Dr. Isaac Hays	Philadelphia,	Pennsylvania.
Dr. R. Hooper	Boston,	Massachusetts.
Dr. John Jeffries	"	"
Dr. E. Reynolds	"	"
Dr. C. Schweigger	Berlin,	Prussia.
Dr. George Wilkes	New York,	New York.
Total		7
Whole Number		50

AMERICAN

Ophthalmological Society.

The American Ophthalmological Society held its sixth annual meeting at the Atlantic House, Newport, Rhode Island, July 21st, 1869. It was called to order by the President, Dr. H. W. Williams, of Boston.

The following members were present:

Dr.	C. R. Agnew	New York, N. Y.
"	C. M. Allin	" "
"	H. Derby	Boston, Mass.
"	John H. Dix	" "
"	E. Dyer	Philadelphia, Pa.
"	John Green	St. Louis, Mo.
"	G. Hay	Boston, Mass.
"	E. L. Holmes	Chicago, Ills.
"	W. F. Holcomb	New York, N. Y.
"	B. J. Jeffries	Boston, Mass.
"	E. G. Loring	New York, N. Y.
"	Henry D. Noyes	" "
"	C. E. Rider	Rochester "
"	D. B. St. John Roosa	New York "

The following gentlemen were invited to seats at the meetings and to take part in the proceedings:

Dr.	R. F. Weir	New York, N. Y.
"	W. Argyle Watson	" "
"	N. Bozeman	" "
"	H. Knapp	" "
"	J. O. Green	Boston, Mass.
"	Mauran	Providence, R. I.

The minutes of the last day's meeting of the last session were read and approved.

The following committees were appointed by the Chair:

A Business Committee, whose duty shall be to prepare and present a bulletin giving the titles of papers, the order in which they shall be read and the time they will occupy; to select a topic for discussion at the ensuing annual meeting; to nominate two members of the Publishing Committee; to fix the amount of the annual tax, and to designate the Committee on the Progress of Ophthalmology. The committee consisted of Drs. Agnew, Derby and Holmes.

Another committee was appointed to receive the names of those proposed for membership, to nominate officers, and to report on matters of ethics. The committee consisted of Drs. Green, Jeffries and Dyer.

The Treasurer's report was read and referred to an Auditing Committee, consisting of Drs. Roosa and Holmes.

The Secretary announced the death of Dr. O. M. Pray, of Brooklyn, N. Y., and alluded to the estimable traits of his character. Dr. Agnew made similar remarks.

The Auditing Committee reported the Treasurer's accounts correct and properly vouched for. The report was accepted.

The Business Committee reported the first paper, viz.:

Test Letters for Astigmatism, by the late Dr. O. M. Pray, presented by Dr. Noyes. Remarks were made by Drs. Green and Williams.

The second paper was presented by Dr. B. Joy Jeffries, referring to a case of synchisis. Remarks were made by Drs. Knapp and Green.

Third paper. The inaccuracy introduced into tests for vision by disregarding the magnifying or diminishing effect of spectacles, by Dr. Knapp.

Immediately after the conclusion of Dr. Knapp's paper the Society went into executive session. On returning to open session, Dr. Knapp's paper was discussed by Drs. Noyes and Jeffries. The papers already read were referred to the Publishing Committee.

Fourth paper. Case of vascular tumor of the iris, with colored illustration, by Dr. Roosa.

Cases somewhat similar were reported by Drs. Dix, Williams and Holmes. Referred to Publishing Committee.

The fifth paper was presented by Dr. Green, on the use of leaden styles in the treatment of lachrymal disease.

Remarks were made upon the subject by Drs. Derby, Agnew and Dix. Dr. Noyes alluded to the use of hard rubber styles in his own practice, and also reported some cases of the performance of Stilling's operation for internal division of the stricture, and exhibited a knife for this purpose.

The sixth paper, on Strabismus, was presented by Dr. Loring. A part only was read, when, by the author's request, the whole paper was referred to the Publishing Committee.

Seventh paper, on test types, by Dr. Jeffries. Referred to Publishing Committee.

At 3 P. M. adjourned to meet at 5 P. M.

JULY 21, 1869.

The Society met at 5 P. M. The minutes of the preceding session were read and approved.

Dr. Agnew moved that the Society be allowed to pay the cost of engraving the plates for the illustration of Dr. Green's paper on Astigmatism in the last number of the Transactions. Carried.

The next business was the

Eighth paper, on Divergent Strabismus, illustrated by photographs of cases, by Dr. Agnew. Dr. Jeffries alluded to the danger of ulceration of the cornea. Dr. Noyes instanced cases of panophthalmitis. Dr. Knapp described his mode of operating. Dr. Agnew was requested to put his statements in writing, and then to be referred to the Publishing Committee.

The ninth order on the bulletin was a case of spontaneous dislocation of the lens, by Dr. Holmes. Referred to Publishing Committee.

Tenth. Case of spontaneous dislocation of the lens, by Dr. Williams. Referred to Publishing Committee. Dr. Rider described a similar case.

Eleventh paper. Monocular Glaucoma supervening upon binocular retinitis hemorrhagica, by Dr. Roosa. Referred to Publishing Committee.

Twelfth order on the bulletin, a modified form of ophthalmoscope, by Dr. Loring.

Dr. Noyes also exhibited a new form of ophthalmoscope. The description of both instruments to be put in writing and referred to Publishing Committee.

Thirteenth. Dr. Noyes exhibited a variety of specula for separating the lids, and other instruments. He was requested to furnish a written description of such as are new and desirable, and put it in the hands of the Publishing Committee.

Adjourned to evening entertainment at 9 P. M., and to business session at 9 o'clock to morrow morning.

JULY 22, 1869.

The Society met at 9½ A. M., in executive session. After entering upon open session the Business Committee reported Newport as the place for the next annual meeting. They reported as the Publishing Committee Drs. Loring, Roosa and the Secretary. The annual tax for the ensuing year, $10.00. Committee on the Progress of Ophthalmology, Dr. B. J. Jeffries. All of which recommendations were adopted.

Dr. Dyer gave notice of an amendment to the By-Laws, making Thursday the day of meeting, instead of Wednesday.

The Committee on Admissions reported the names of Drs. H. Knapp, of New York, and Robert Watts, of New York, both of whom were elected. On motion, adjourned for recess of fifteen minutes.

On resuming the session the Business Committee reported the following for officers for the next year:

President, Dr. H. W. WILLIAMS, of Boston.

Vice-President, Dr. C. R. AGNEW, of New York.

Recording Secretary and Treasurer, Dr. HENRY D. NOYES, of New York.

Corresponding Secretary, Dr. H. ALTHOF, of New York.

All of whom were elected.

The amendment naming Thursday in place of Wednesday as the day of beginning the annual meeting, was adopted.

The next topic on the bulletin was in order.

Fourteenth. Dr. Dyer exhibited an apparatus for making graduated pressure on the eye by means of a column of water.

Remarks to be reduced to writing and referred, with suitable illustrations, to the Publishing Committee.

Fifteenth. Dr. Agnew described his mode of dressing the eye after important operations. Remarks to be put in writing and referred to Publishing Committee.

Sixteenth. Dr. B. J. Jeffries read a paper on photography of the fundus oculi. After remarks by Drs. Noyes and Knapp, referred to Publishing Committee.

The Business Committee reported as topic of discussion for the next annual meeting—

"Ophthalmic therapeutics, their occasional abuse."

The committee expressed the hope that the discussion of this subject, within proper limits, may tend to lessen the indiscriminate use in medical practice of irritating collyria and patent drugs, as well as to restrain the employment of certain panaceas. The subject was adopted.

The following were the papers next in order on the bulletin.

Seventeenth. Cyst of the iris, by Dr. Knapp.

Eighteenth. Apparent movement of muscæ, by Dr. G. Hay.

Nineteenth. Two cases of sympathetic ophthalmia, by Dr. H. W. Williams.

All these papers were duly referred.

Dr. Agnew offered the following resolutions:

Resolved, That all communications made to the Society at this annual meeting be delivered to the Publishing Committee before October 1st.

Resolved, That proofs of all articles appearing in the Transactions be sent to their authors returnable to the committee within one week; in case the proofs are not so returned the articles may be omitted, at the discretion of the committee.

The resolutions were adopted.

Dr. Green moved that arrangements be made for publishing the Transactions of the Ophthalmological and Otological Societies jointly. Carried.

Dr. Dyer reported additional cases of fracture of the crystalline lens in cases of death by hanging. Dr. Dyer was requested to furnish to the Publishing Committee a report of all the cases of this kind which he has yet observed.

On motion, adjourned.

HENRY D. NOYES,

Recording Secretary.

A Case of Simple Synchisis. By B. Joy Jeffries, of Boston, Mass.

A. B., a perfectly healthy gentlemen, some five and twenty years of age, applied to me March 27, 1867. Five days previous he noticed a "sudden darkening" before his left eye. He has, and has had, no pain or other sensation about the eye, complaining only of the "cloudy darkening." Externally the eye looks perfectly normal. Right eye V. = 1-1; without atropine and by Jäger's weak light the fundus was found normal. Left eye, the patient could read about Jäger Nos. 8 to 10, the exact number not being recorded. Under atropine the pupil dilated readily, and the ophthalmoscope showed black shreds moving freely in the fluid vitreous and some black stationary particles; the fundus could be but dimly lighted and was not clearly seen. Patient was ordered grs. ij. pillulæ hydrg. every night, the eye to be shaded, and rest. Four days later the pupil remained dilated, and the papilla could be indistinctly seen. Few threads were seen and no fixed black spots as before. Four days after this the patient read Dyer's L. at 20 feet, V. = 2-5, and Jäger No. 2 at 10 inches. The nerve and vessels could now be seen; the latter were rather congested. The field of vision was taken and found much limited on the upper part, as seen in the accompanying register. A leech to the temple was ordered and cathartic medicine *pro re nata*. Two days later much the same, except the eye was more sensitive to light; shade to be worn and eye to be protected from glare and exposure. The vitreous cleared up steadily after this, and nine months later I saw the patient accidentally; he speaks only of a few muscæ volitantes. April 4, 1869, two years after commencement of the liquefaction of the vitreous, the ophthalmoscope reveals nothing abnormal but one floating opacity, seen at the same time by the patient. V. = 1-1 in each eye, reads Jäger No. 1 fluently, at 10 inches, with either eye. The field of vision was tested and found normal. Patient now says that previous to the sudden obscuration he had occasionally, when not feeling well, noticed muscæ volitantes.

Liquefaction of the vitreous humor accompanies or is the consequence of very many of the traumatic and idiopathic diseases of the ocular tunics. Till the researches of Virchow

and Weber it had been a matter of great doubt whether the vitreous is capable of inflammation in the ordinary sense of the word, since the changes it undergoes might be attributed to the effect of inflammation in some of the tissues around it, and any thing which could affect it might equally well be supposed to affect these tissues.

Upon examination of the authorities I cannot find it anywhere recorded or admitted that the vitreous may inflame, or, if this word is objected to, may break down and become fluid, without other disease of the eye, *either before or after its liquefaction*. Hence the importance of this case, and my only excuse for reporting it. Its value, I freely admit, depends entirely on the exactness of the record and the capacity of the observer to decide the presence or absence of other disease. Not imagining such a complete restoration of vision possible, my prognosis was guarded, and not favorable as respected subsequent sight. To me it does not seem probable that any disease of the surrounding tissues, which could cause such complete and sudden turbidity of the vitreous, should exist without exhibiting symptoms recognizable by the tests this eye was subjected to.

THE INACCURACY INTRODUCED INTO THE DETERMINATION OF VISUAL ACUTENESS BY DISREGARDING THE MAGNIFYING OR DIMINISHING POWER OF SPECTACLES. By H. KNAPP, of New York.

Visual acuteness depends upon the density of the percipient retinal elements. The deviation of the lines which connect two nearest retinal elements with the posterior nodal point is called the smallest visual angle. The size of this angle may be changed by widening the shortest distance between two approaching retinal elements (amblyopia), or by alteration of the position of the nodal points, especially the second one, as is the case when we look through spectacles. The diminishing power of concave lenses may *simulate* amblyopia, and the magnifying power of convex lenses may *conceal* amblyopia. That spectacles produce this effect is well known, but how great the error introduced by them is has not yet been deter-

mined. To get a thorough understanding of the effect of spectacles on vision, we must calculate the optical constants of a dioptric system combined of glass lenses and our eye. This I did, and used the respective formulæ in Helmholtz's "Physiologische Optik," p. 56, 11 *a*, etc.

The *first focal point* is found by formula 11 *a*:

$$a_{,}\, f_{,} = \frac{(d - \phi_{,})\, f_{,}}{d - \phi_{,} - f_{,,}}$$

If we place the lens 14.858 mm. before the first principal plane of the eye, the above expression becomes 0, which means that the *first focal point of the compound system coincides with the optical centre of the glass placed in the first focal point of the eye.*

The *first principal point* is determined by formula 11 *d*:

$$h_{,} = \frac{d\, f_{,}}{d - \phi_{,} - f_{,,}}$$

Since $f_{,} = f_{,,}$ and $d - \phi_{,} = 0$, therefore,

$$h_{,} = -\, d = -\, 14.858;$$

which means that the first principal point of the compound system lies 14.858 mm. ($= \phi_{,}$) behind the first principal point of the first system, viz., behind the optical centre of the glass lens. Therefore, the *first principal point of the compound system coincides with the first principal point of the eye.*

The first nodal point may be determined by a similar equation, viz.:

$$k_{,} = \frac{d'\, f_{,,}}{d' - \phi_{,,} - f_{,}}$$

d' is the distance of the second nodal point of the first system, viz., the optical centre of the glass lens, from the first nodal point of the second system, and equals, in our case, the second focal length of the second system, $\phi_{,,} = 19.875$ mm.

$$f_{,,} = f_{,} \text{ and } d' - \phi_{,,} = 0.$$

In the above equation, therefore, $k_{,} = -\, 19.875$ mm., which means that the first nodal point of the compound system lies

19.875 mm. behind the second nodal point of the first system, that is, the optical centre of the glass lens, and at the same time the first focal point of the second system. Therefore we see that the *first nodal point of the compound system coincides with the first nodal point of the eye.*

The *second principal point* is found by Helmholtz's formula 11 *e*:

$$h_2 = \frac{d\ \phi_{II}}{d - \phi_I - f_{II}}$$

$d - \phi_I = 0$, the formula simplifies in

$$h_2 = \frac{d\ \phi_{II}}{-f_{II}}$$

Let us call the value of this equation $-\delta$ (δ being a positive number), then we see that the second principal point of the compound system falls in front of the second principal point of the eye. Since the distance of the nodal points from each other equals the distance of the principal points from each other, the second nodal point will lie as much in front of the first nodal point as the second principal point lies in front of the first principal point. We have, therefore, but one calculation to make.

If we put concave glasses before the eye, the value of h_2 in formula 11 *e* becomes positive, but does not change in quantity. This shows that by concave glasses of equal focal length, the second cardinal points recede as much as they advance by convex glasses.

This is all we have to calculate directly. We know the situation of the second nodal point, and know that its distance from the retina, the second focal plane, equals the first focal length. Since the first focal and nodal points of the compound system coincided with those of the unarmed eye, it is evident that also the second focal length of the armed eye is equal to that of the unarmed eye.

Thus far I have demonstrated the *remarkable fact that spectacles worn half an inch before the eye do not alter the position of the first cardinal points, nor the focal lengths of the eye, whilst they cause the second cardinal points to move by the same quan-*

tity and in the same direction, namely, forward if the spectacles are positive, and backward if they are negative.

Let us now consider what influence spectacles have on visual acuteness.

By my own and Donders' measurements we know that the radius of curvature of the cornea in ametropic eyes does not materially differ from that in emmetropic eyes. With regard to the curvature of the lens, only two measurements have been made, one by Helmholtz and one by myself, on myopic eyes. Both eyes showed no difference from the normal state. Similar conditions may be assumed in the hyperopic eye. Therefore, we may suppose that the optical constants of ametropic eyes do not materially differ from those of emmetropic eyes. The receding or advancing of the retina must be the cause of ametropia, a fact which is well corroborated by anatomical investigation. Since the retrocession or advancement depends on a dilatation or contraction of the posterior portion of the globe, the retinal elements will stand closer together, or wider apart, according to the degree of contraction or dilatation, and a visual angle of the same size, and having its apex in the first nodal point, will include about the same number of percipient retinal elements in the ametropic as in the emmetropic eye. By the addition of spectacles the first cardinal points do not change, as we have seen, but the second are advanced by convex glasses, and moved backward by concave glasses; *the visual angle, however, remains unchanged,* as the axial ray is only shifted on the optical axis parallel to its first direction. The greatness of this shifting—that is, the displacement of the second nodal point on the axis—determines the enlargement or diminution of the retinal image belonging to one and the same object. Since the triangles formed by the retinal images and their connecting lines with the second nodal point in its primary and secondary position are similar, *the dimensions of the retinal images are proportionate to their distances from the second nodal point.*

The distance of the posterior focal plane (retina in the emmetropic eye) from the second nodal point being equal to the first focal length of the eye (ϕ_1), we obtain the following relation of the retinal images without glasses (β) and with

glasses (β_{II}) to their distances from the focal point in the emmetropic eye (ϕ_I) and the ametropic eye ($\phi_I \mp \delta$):

$$\frac{\beta_{II}}{\beta_I} = \frac{\phi_1}{\phi_1 - \delta}$$ for convex glasses, and

$$\frac{\beta_{II}}{\beta_I} = \frac{\phi_I}{\phi_I + \delta}$$ for concave glasses, δ being the quantity by which the second nodal point is displaced.

If we give β_I the standard value 1, we obtain for lens + 10

$$\beta_{II} = 1{,}0793.$$

If an object is seen without glasses, at a certain distance, say Snellen XX. at 20 feet, the magnifying power of +10 will render its retinal image 1.0793 times larger. To let it appear of equal size with the image seen without glasses by an emmetropic eye, its distance is to be multiplied with the magnifying effect of the lens, viz., 1.0793. Thus we obtain that a hypermetropic eye of normal visual acuteness sees Snellen XX. at 21.58′ distance when looking through convex No. 10.

f_2 being negative, that is the glass lens concave, the absolute value of k_2 remains the same, but becomes positive, which means that it lies behind the second nodal point of the eye. The relation between the retinal images and their distances from the nodal points is as follows, for concave No. 10:

$$\frac{\beta_{II}}{1} = \frac{\phi_I}{\phi_I + \delta} = \frac{14.858}{14.858 + 1.0909.} = 0.9316.$$

The value of the diminishing effect of the glass multiplied with the number of the test type gives the distance in which an eye reads through — 10 the same numbers of the test type, f_I i_I No. XX. Snellen at 18.63 feet distance.

You see that for spectacles below 10 the magnifying or diminishing power of glasses has but little influence on visual acuteness, and may be neglected. We may even neglect it until we come to No. 5. I shall give you the results of my calculations for No. 10, No. 5, and the lower numbers, in a table.

No. of Glass.	Advancement of $k_{,,}$ second nodal point)	Magnifying effect of Lens.	Distance in which Snellen XX. ought to be read by normal S with glass.
	Mms.		
+ 10	1.0909	1.0792	21.59
+ 5	2.1818	1.1721	23.44
+ 4	2.7272	1.2248	24.45
+ 3	3.6303	1.3240	26.48
+ 2	5.4544	1.5800	31.60

No. of Glass.	Receding of $k_{,,}$	Diminishing effect of Lens.	Distance in which Snellen XX. ought to be read by normal S with glass.
— 10	1.0909	0.9316	18.63
— 5	2.1818	0.8720	17.44
— 4	2.7272	0 8449	16.90
— 3	3.6303	0.8034	15.07
— 2	5.4544	0.7315	12.63

Vascular Tumor of Iris, probably Sarcomatous, with Colored Plate. By D. B. St. John Roosa, M. D., of New York.

Ann E., aet. 40. Irish. A quite well nourished, healthy woman. She states that about seven years ago there appeared at the ciliary margin, nasal side of the iris of right eye, a small red spot, about as large as the head of a pin, which was neither preceded nor followed by irritation. This spot did not increase in size for about five years, when an inflammation of the eye occurred, which, from the subjective symptoms narrated by the patient, seems to have been an iritis. Since then the spot has steadily grown in size.

In February, when she was presented at my clinic at the University Medical College, by Dr. Chas. I. Pardee, my assistant, the appearances were a perfectly transparent and healthy cornea, covering a pink colored growth that almost filled the anterior chamber. Blood vessels were distinctly traced over it, and it was dotted by numerous white spots nearly the

size of a hemp seed. The mass was evidently well organized; at the upper and outer margin, the dilated rim of iris was visible for a length of about four or five lines. Perception of light was positive and distinct in all parts of the field of vision. (See chromo-lithograph.)

In July the white spots in the growth had increased in number, in size, and the volume of the tumor seemed somewhat greater. The tumor was supposed to be sarcomatous, and to have its origin from the ciliary corner of the iris. Enucleation was advised, but the patient refused to submit to the operation.

Remarks on the use of Leaden Styles in the Treatment of Lachrymal Obstructions, with Description of a New Plan for Facilitating their Introduction. By John Green, M. D., of St. Louis, Missouri.

In a communication to this Society at its last annual meeting,[1] I brought forward a modification of Dr. E. Williams' plan of treating lachrymal obstructions by wearing for several weeks a silver style, inserted through an opening made by slitting the upper canaliculus into the lachrymal sac.[2] The modification proposed by me consists in the substitution of the softest and most flexible lead wire for the rigid silver styles employed by Dr. Williams. The advantage claimed for this substitution depends upon the fact that the bony nasal duct is not quite straight, but is curved in a somewhat variable and therefore uncertain direction.[3] Besides this irregularity in the curvature of the bony duct, the position of the lower opening into the inferior meatus of the nose is equally variable, thus necessitating, in some cases, the passage of the style nearly to the floor of the nostril. In consequence of these variations it is often difficult to pass a large and stiff probe

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[1] See Transactions for 1868.

[2] This method is fully described by its author in the first part of Vol. i. of Knapp and Moos' Archives.

[3] The convexity of its curve is turned forward and outward (Cruveilhier)—forward (L. Hirschfeldt, *in text*), outward and backward (L. Hirschfeldt, *in plate*)—outward and backward, but differing in almost every case, being sometimes more pronounced outwardly, sometimes posteriorly. (Stellwag.)

entirely through the obstruction, especially when it occurs at the lower orifice of the duct; or if the probe is successfully passed, it must be speedily removed on account of the severe pain excited by its unequal pressure. A leaden probe of the same or even of larger size passes with comparative ease, adapting itself readily to the sinuosities of the passage, and causes comparatively little pain by its continued presence. The leaden styles are therefore much more readily tolerated, and the smaller sizes can be more rapidly exchanged for larger, than is the case with the more rigid instruments of silver. The period of treatment is thus materially abridged, especially as experience has shown that less dilatation is necessary than with the silver styles, and that medication of the sac by injections may, in most cases, be dispensed with.

The difference in the effect produced by wearing the flexible leaden styles, as compared with the rigid instruments of Dr. Williams, is important. By the use of the silver styles the lachrymal passages must, in many cases, be not only dilated, but also changed somewhat in direction to conform to the shape of the style; with the leaden instrument, on the other hand, it is simply dilated. This difference is well illustrated by the fact that the leaden probes always adapt themselves to any irregularities in the direction and curve of the nasal duct, and exhibit, after they are withdrawn, a very considerable curvature, varying in different cases, but uniform in the successive stages of the treatment of the same case.

The only drawback to the usefulness of this plan of treatment has been the difficulty of manipulating the very flexible lead wire, especially the smaller sizes. This is now remedied by making the styles tubular, and inserting a stylet of tempered steel wire. The stylet is withdrawn as soon as the style is placed in position, and the projecting top of the latter is bent over so as not to interfere with the movements of the eyelids. In this way the styles are readily introduced even to the floor of the nostril, and yet can be worn with, in most cases, only a very slight degree of discomfort.

The styles which I now use are of seven sizes, extending from seven-eighths of a millimetre to two millimetres in diameter, and numbering from twenty to fourteen of the com-

mon English wire gauge. Only the three or four smaller sizes require the steel stylet, but the larger sizes also may be made tubular in order to reduce their weight.

This method has proved extremely convenient in the treatment of certain obstinate cases of catarrh of the lachrymal sac, with obstruction at the lower end of the nasal duct. In treating such cases by Mr. Bowman's method, it sometimes happens that little or no permanent effect follows the successive introductions of the probe, but that by wearing a rather large style for a week or two, a free passage is opened. It is quite important, therefore, to be able to dilate the lower orifice of the duct with the least possible interference with the integrity of the bony portion of the canal; this indication is much more perfectly fulfilled, and the desired end more quickly reached, by the use of the flexible leaden styles than by the rigid ones used by Dr. Williams.

The use of metallic styles in the manner recommended by Dr. Williams, and especially of leaden styles, as described in this paper and in the last volume of these Transactions, will, I believe, be accepted as a valuable addition to the means previously at our command for the treatment of those severer and more obstinate cases of lachrymal obstruction in which the destruction of the sac by the hot iron or by caustic is still frequently practiced. In the milder forms of obstruction, which constitute the great majority of cases treated, I prefer Mr. Bowman's admirable method, by the intermittent use of probes, to all other known plans of treatment.

Relative Accommodation in Strabismus and Insufficiency of the Recti Muscles. By Edward G. Loring, M. D., of New York.

Mr. President: At our last meeting I had the honor of reading before the members of the Society a paper on Relative Accommodation.[1] My remarks at that time referred almost exclusively to the physiological connection between convergence and accommodation in the normal eye. It is now my desire to lay before you, as briefly as possible, some points

[1] Relative Accommodation. Trans. American Oph. Soc., July, 1868.

which seem to me to be of practical importance in regard to the manner in which these two muscular forces react, or may be made to react, upon each other in strabismus and insufficiency of the recti muscles.

It may be stated as a general law that, within certain limits, by increasing or decreasing the convergence, the amount of accommodation is also increased or diminished.

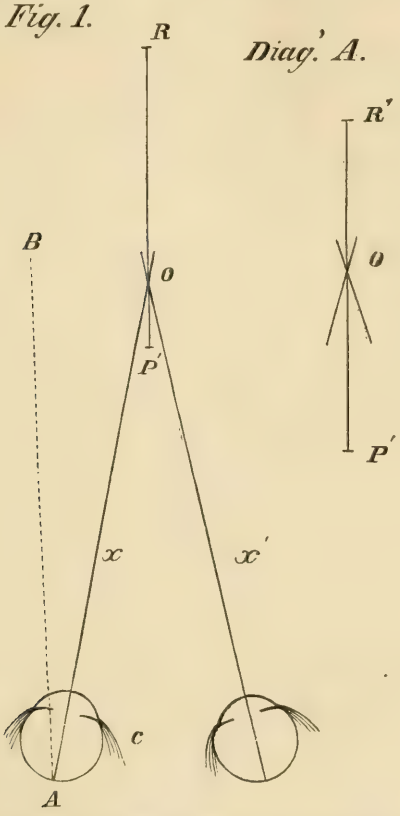
It was in accordance with this law that the practice, adopted by the earlier practitioners, of dividing the recti interni in those cases of asthenopia where there was no strabismus, often met with success. This was at a time when the errors of refraction were not understood as they now are, and when the true nature of hypermetropia and its results had not been recognized. At a somewhat later period Donders, with his vast and exact knowledge of the whole subject, could not refrain from characterizing this practice of dividing the interni, where there was no squint, as a "melancholy page in the history of ophthalmic surgery," while on the other hand no less an authority than Von Graefe not only sanctioned this division of the muscles under these conditions, but had even performed it on two occasions.

His justification of the operation and explanation of its modus operandi are so admirably given, and so essential for a correct understanding of what is to follow, that I will briefly read them to you in his own words. Von Graefe, speaking of the treatment of asthenopia in hypermetropic eyes, in which, however, there is no strabismus, says: "There is still another cure for asthenopia which is founded on the displacement of the relative accommodation. If we weaken by a suitable tenotomy of the internus its effective ability, in such a way, however, that a correct position of the eye operated upon shall still be maintained, then every given degree of convergence will be represented by a greater tension of the interni than that existing before the operation, and a corresponding displacement of the region of the relative accommodation toward the absolute near point will be the result. The demands on the energy of the accommodative force will consequently be less." (Arch. 8., ab. ii., s. 320.)

The principle involved in this statement is so important to

the subject under consideration, that I would call your attention for a moment to the diagram which I have drawn upon the board (Fig. 1), which is supposed to represent the condition taken by Von Graefe, that is to say, a pair of hypermetropic eyes suffering from asthenopia, but in which there is no

Fig. 1. *Diag. A.*



strabismus. x and x' represent the optical axes, both of which intersect each other at the object viewed, o, supposed to be at 14 inches from the eye. In all hypermetropic asthenopic eyes the amount of accommodative force actually used is greater than that which is held in reserve. The amount used in this case may be represented diagrammatically as extending on the vertical line from the point o to the point R′, that held in reserve as extending from o to P′.

If we now divide one of the interni, say the left, *c*, a certain amount of divergence of the optical axis, *x*, from its former position would be the immediate result, exactly as it is in the common operation for strabismus. This divergence may be represented on the diagram by the dotted line extending from the point B to the point A, and it is self-evident that the tension on the internus, in order to make *x* regain its former position—*i. e.* intersect with its fellow at *o*—must be as much greater, after the operation than it was before, as the divergence is greater. Now what holds good for one degree of convergence holds good for all; and as we have increased the amount of tension on the interni for every given degree of convergence, we have, according to the law, also increased the amount of accommodation, or, as Von Graefe more exactly expresses it, we have displaced the region of relative accommodation toward the absolute near point. This displacement may be represented by diagram A in Fig. 1. The whole relative accommodation will be seen to have been displaced toward the eye; the amount of force actually expended, represented in the line by the distance between *o* and R′, is seen to be much less, while that held in reserve is much greater than before the operation.

There can be no doubt then as to the truth of the statement that by cutting the interni we increase the amount of tension for a given degree of convergence, and that by so doing we do indeed, temporarily at least, displace the relative accommodation. But then this can only happen without exception, when binocular vision was present before the operation and is maintained after it. We can, therefore, by no means agree with the illustrious author when he continues by saying:

"When, on the contrary, in consequence of hypermetropia, convergent squint has resulted and characterizes the patient, not only at work, but at other times, I am then an advocate for tenotomy, which then in all respects appears rational. The better position of the eyes, which is obtained by the operation, will, *since a greater tension of the interni is represented, exercise the same effect on the range of relative accommodation as did the original condition of the convergence,* which was not only disfiguring, but which threatened the functions of

the organ for continuous work."[1] (Arch. 8, ab. ii., s. 321, note.)

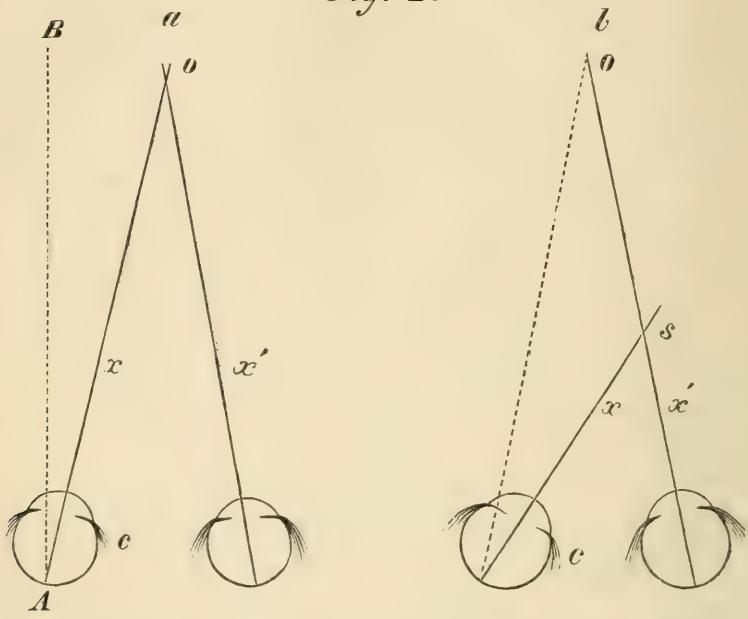
Now the conditions in the two cases taken by Von Graefe, namely, squinting and non-squinting eyes, are not the same, and we have no right to assume that if the same principle be applied to both it will in both be followed by the same results. The difference in the conditions taken will, perhaps, be made clearer by reference to Fig. 2, in which diagram *a* represents a pair of non-squinting eyes, and diagram *b* a case of well marked strabismus in the left eye. The other conditions we will suppose to be the same as those previously taken. It will be remembered that in the first diagram, representing non-squinting eyes, that binocular vision already existed before the operation, but that immediately after it there was a certain amount of divergence of the optical axes of the eye operated upon relative to the object viewed, which necessitated, in order that binocular vision might be reinstated, a certain amount of tension on the interni over and above what they used before the operation. But in the second diagram (Fig. 2, *b*), representing squinting eyes, if we cut the left internus so that the optic axes of this eye intersects with that of the right at *o*, and we thus obtain binocular vision, we have obtained it, not as in the former case, from a state of divergence relative to the object viewed, but from a state of convergence; so it will be seen that the conditions are at the outset very different. But in order to understand the question fully it will be necessary to recur briefly to the principle or law upon which the assertion is founded—"That after a tenotomy a greater tension of the interni is represented, with the same effect on the relative accommodation."

This depends upon a law propounded by Von Graefe some years ago, that the effect of a tenotomy is in exact relation to the amount of displacement of the insertion of the muscle. That is to say, a convergent strabismus of three lines will be removed by setting back the insertion of the muscle three lines, etc., etc. This law is founded on mechanical principles, and is perhaps as correct as the application of any mechanical

[1] The italics are my own.

formula to the human organism can be, where the conditions in no two cases are ever alike, and where they are constantly varying in the same individual case.

Fig. 2.



In order to explain this theory it was assumed that the amount of labor imposed upon the interni increased *pari passu* with the displacement backward of the insertion of the muscle, so that, although the convergence is lessened by the operation, the tension on the interni demanded to maintain this convergence is as great or even greater than before the operation. Admitting even that this is *per se* true, we must not forget that in estimating the power of a muscle which has a direct antagonist we must also take into consideration the force of this antagonist, and bear in mind that if the conditions under which one performs its functions are altered, those of the other are changed also. It must be remembered too that in squinting eyes, just as in others, there is a certain amount of tension on the internus of the eye which turns in, which is counterbalanced by a certain amount of tension of the externus.

Now the effective power of the externi increases with the amount of the convergence, and it must follow that the externus of a squinting eye, other things being equal, is in a better position to lay out whatever power it may possess, than in the case where there is a normal intersection of the optic axes. So it may happen that although the tension demanded of the internus after it has been set back would naturally be the same or even greater than before the operation, yet the ability to oppose this tension on the part of the externi is not as great as it was before, from the comparatively disadvantageous position under which their effective force is applied. That is to say (referring to the diagram, Fig. 2, *b*), it requires a greater effort for the externi to counterbalance a given amount of tension under a correct position of the axes, *x* intersecting with its fellow at *o*, than it previously did under an abnormal degree of convergence, when *x* intersected with its fellow at *s*.

Now if from any cause the externi are idiopathically weak, then their inability to resist the tension of the interni when accommodation is going on may be so great that a proper intersection of the visual lines can only be maintained after the operation, in case the opposing tension of the interni is reduced or even entirely relaxed. If this is true, then we ought to expect, according to the law, that if the tension on the interni is reduced the relative accommodation will not be, as Graefe asserts, displaced toward the near point, but be removed from it. And as a proof that precisely this may take place, and, as I believe, not unfrequently does where binocular vision is obtained, I would beg leave to refer to the following case, recently under the care of Dr. Agnew and myself.

About the first of last May a young lady, 19 years of age, visited us on account of strabismus, with which she had been affected from early childhood. The squint, amounting to about $3\frac{1}{2}$ lines, was perfectly concomitant in its character, as either eye was used indiscriminately, though the patient could always tell, if her attention was called to it, which eye she was for the moment employing. The total hypermetropia under atropine amounted to 1-36, vision being with suitable glasses a little less than one. But though there was this amount of vision in either

eye, no binocular vision in any proper sense of the term could be called forth, though many attempts to produce it were made with prisms, colored glass, Javal's mirror and the stereoscope. The accommodation was normal, as was also the excursion of the eyes, independent of the existing squint. As there was not the slightest contra-indication, and as the cosmetic effect was the only consideration which weighed at all with the patient, the rectus internus of the right eye was divided. As the necessary effect was not obtained by this operation, the other eye was operated upon six weeks later. I will add that, on both these occasions, the tendon was thoroughly separated from the sclera. About the first of October the patient again returned. The effect which had been gained by the last operation had entirely passed away, there remaining about a line of convergence for distant objects and something more for the near. Another attempt was made to see whether binocular vision could not be called forth, but without success. The patient seemed to have, to a marked degree, what is called in the text-books the "horror of binocular vision." As diplopia would not in all probability be caused, even if a slight divergence should be produced, it was determined to run the risk of a third operation, which was consequently performed.

The effect of this operation, after the wound had healed, was not as great as had been feared, only a very trifling degree of divergence being produced, which soon passed away for distant objects, while there still remained a perceptible convergence for the near. I found, however, that there was now an attempt on the patient's part at binocular vision; that once or twice while looking at distant objects she had seen them double. I then gave her Javal's mirror, with which she practiced faithfully for two months, at the end of which time she was able to see, as a constant thing, the three wafers in a vertical line, and was perfectly aware when she was using binocular and when monocular vision. She then informed me that latterly, since she had been conscious of using both eyes at a time, she did not see as distinctly as she formerly did; that she could not read at all when using both eyes, and that even in the street every thing was indistinct, and that she frequently had to shut her eyes, and on opening them again to use only one. When she

did this vision became distinct at once. This led me to make another examination as to the amount of vision and state of the accommodation. I found that when using both eyes at once vision was only 1-5; but with either eye singly it amounted to nearly 1. If, however, + 1-36 (the amount of the total H.) was given to the patient then binocular vision fully equaled, and I thought a little surpassed, the monocular, rising from 1-5 to nearly 1. So too in reading it was found that + 1-10 was the weakest glass through which there was easy and rapid binocular vision at 14 inches. (This convex 1-10 just represented the total H., 1-36, and the distance of the object seen, 14 inches.) Each eye singly, however, could read correctly at 5 inches without the aid of any glass, though only when its fellow deviated inward, the amount of this deviation decreasing with the strength of glass used till it entirely ceased under + 1-10.

It will be seen from the above that under binocular vision, and what may be certainly termed "a better condition of the optical axes," not only was the relative accommodation not displaced toward the absolute near point or remain as it was before the operation, but was removed from it, and that too to such a degree as to be annihilated, no accommodation at all remaining for any given degree of convergence from the negative far point (Ht. 1-36) to the nearest point of binocular vision at which the eyes were still accommodated for convergent rays.

But it may be said that the operations themselves had in some way so destroyed the relationship between the accommodation and the convergence that the former could not be brought into play. Admitting that this is just what did take place, it does not follow that this result is due simply to operative interference, for precisely the same thing may take place even when no operation has been performed; for Schweigger, in his remarkable monograph on strabismus, gives a minute report of a case of squint of four lines, in which binocular vision was obtained by systematic exercise with prisms. In this case, as in the one just reported, the total hypermetropia at once became manifest as soon as binocular vision was obtained, and the field of accommodation was so far removed that even with a convergence to eight inches the eyes still remained accommodated for convergent rays. (Zehender, Jan.–Feb., 1867, p. 8.)

In summing up the remarkable points of this case Schweigger mentions, as two of its individual peculiarities, that under the influence of binocular single vision the previously existing latent hypermetropia became manifest, and that the relative accommodation was displaced. I cannot think that these are by any means individual peculiarities of this particular case, as I have myself not unfrequently seen the latent hypermetropia become manifest after the operation, but have also occasionally seen the displacement of the relative accommodation, and believe that we should see it oftener if we examined carefully for it *immediately* after the operation; but the fact is, it is a much rarer thing to obtain real binocular single vision in a case of marked strabismus than we should be led to suppose from the books. I cannot think that results as remarkable as those mentioned in Schweigger's case and the one just described can be the result of chance, but believe that they are due to the common law which governs the connection between convergence and accommodation.

It seems to me that these two cases offer a beautiful example of the law sought to be established in my former paper, that for every increased tension of the ciliary muscle there is a corresponding and contemporaneous tension imparted to the interni. For, provided that accommodative efforts ceased, and the ciliary muscle consequently entirely relaxed, the externi, stimulated by the instinctive desire for binocular vision, had force enough to obtain the proper position of the optical axes, but not enough to *maintain* it, under the action of the ciliary muscle; for the slightest attempt to accommodate the eye, even for parallel rays (Ht. being only 1-36), at once destroyed binocular vision, producing convergent strabismus. This certainly could not have been the case had the tension of the ciliary muscle been independent of—that is to say, capable of being disassociated from—the interni. And I believe in all cases where binocular vision has been obtained from a condition of marked strabismus, that the reason why it is permanently maintained is not because the tension of the ciliary muscle is disassociated from that of the interni, but because the tension, imparted to them under accommodative efforts which would turn the eye in, is counterbalanced by the externi,

their natural antagonists, which keep the eyes straight. Now the desire for binocular vision and the power of the externi to fulfill this desire, vary exceedingly in different individuals, which accounts for the ease or difficulty with which, other things being equal, they obtain and maintain binocular vision, and neutralize any effect which the operation may have had on the relative accommodation.

There are very many points in this connection which I would gladly dwell upon, did not the limits of these remarks and a proper regard for your patience forbid.

The particular point of practical importance to which I wished to call your attention, and to arrive at which I have taken what may appear to you a needlessly long route, is this. *That where we have obtained binocular vision from a state of squint, we cannot tell what glasses may be necessary for its easy maintenance, even when we know the exact state of the refraction and the amount of monocular accommodation before the operation.* Take the case in question. Here there was only a total hypermetropia of 1-36 with a monocular accommodation of 1-4, and it might surely be supposed that binocular vision might, with so slight an error in refraction and such a range of accommodation, be maintained without any glass at all, or at the most with a correction of the total hypermetropia. But it not only required that this should be neutralized, but a very strong glass in addition, a convex 1-10 being the weakest glass which made binocular reading possible at 14 inches, which is over three times the amount of the total hypermetropia. So, too, in Schweigger's case, where the glass required for 8 inches was more than twice the total H.

May not the above fact explain the reason why convergent squint is so apt to recur after an operation even in emmetropic eyes, and why also we find it so difficult to obtain binocular vision in such eyes, especially for near work? And ought not such cases to point out the necessity for ascertaining at once what effect the operation has had on the relative accommodation? And if the effect has been to diminish and displace it outward, the deficiency should at once be supplied by the proper convex glasses, which should be gradually reduced in strength as the patient learns to associate a larger amount of

accommodation with a smaller degree of convergence than he has been in the habit of doing; that is to say, till he learns, for the sake of binocular vision, to oppose the tension on the interni by a counterbalancing effort on the part of the externi.

The best result which can be obtained after a tenotomy is, of course, binocular single vision, and this result should always at least be aimed at, even though there be a large amount of amblyopia in the squinting eye; for, by a correct intersection of the visual lines, the combined field of vision of the two eyes is increased in size, for the images formed upon the retina of the amblyopic eye, though not intense enough to produce real binocular single vision, are yet quite enough to give the patient perception of objects situated laterally, and thus free him, to a considerable extent, from the necessity of that continual turning of the head common to those who have only monocular vision. It is indeed asserted that even in its abnormal position the squinting eye often renders important aid, not only in lateral qualitative perceptions, but even in increasing the intensity of the impressions of the fixing eye. (Graefe.)

There is a great discrepancy among authorities as to the frequency in which binocular vision is obtained after tenotomy—Graefe and others putting the percentage as high as fifty in the hundred in its favor, while Stellwag boldly asserts that binocular single vision is scarcely ever, if ever at all, obtained.

It is manifest that both these statements are extreme, and that if, on the one hand, Graefe's statistics are, as Stellwag claims, made up on entirely untrustworthy data, his own are deduced from results given by tests which are entirely too severe. I allude to the so-called falling test of Hering. It is certainly any thing but fair to expect that a person who has been accustomed, perhaps all his life, to judge of distances with one eye with the assistance of surrounding objects, should, when these are excluded, be able, even when using two eyes, to obtain at once, after an operation, as keen a perception of perspective as those who have always possessed binocular vision.

Without at present entering further into this subject, I feel convinced that we often obtain a fair, sometimes even a very

large amount of binocular single vision—quite as much and sometimes more than is to be found among those whose optical axes have always intersected in a normal manner, but yet where, for some reason, one eye was amblyopic, as among those, for example, who have a large discrepancy in the refraction of the two eyes. For in these cases not only does the most ametropic eye always extend the field of vision, but often aids materially, even when the discrepancy is of a considerable degree, in the patient's estimation of perspective. This being the case, we should always endeavor by every means in our power, therapeutical as well as surgical, to obtain for the squinting eye as large a share in the common act of vision as possible, and should never be satisfied, as many are, with simply obtaining a good cosmetic result.

We can all of us call to mind numerous cases in our own and in our colleagues' practices where the intersection of the visual lines appeared perfect and where there was acute vision in both eyes, but yet where there was no single binocular vision; and I fear that most of us have been in the habit, after a few or perhaps without any trials with prisms, etc., of sending such patients away, quite as much elated by our own prowess in doing a tenotomy as the patient is by an improved personal appearance, and each as indifferent as the other whether vision is performed with two eyes or one.

The remarkable manner in which some patients will regain and maintain binocular vision, even after this has been lost for years, is too well proved by authenticated cases to need much comment. To show, however, that it may be often brought about by simple therapeutical means, and to illustrate some further points, I beg leave to cite the following case.

Miss L., some five years ago, had been operated upon for what she characterized as a "fearful squint." There had been two operations on the right and one on the left eye. The deformity seems to have been entirely removed, the optic axes apparently intersecting at the object viewed. The patient simply complains now of asthenopia. Vision is 1, in both eyes, though there is no binocular single vision. After a good many trials with prisms, Javal's mirror and the stereoscope, the patient was finally brought to have double vision, the

images being invariably homonymous, and separated about 10° of prisms in twelve inches. Paralysis of the accommodation showed hypermetropia = 1-9, though the patient had previously been wearing + 1-36. This would account for the asthenopia. After the atropine had passed off I ordered 1-18 for the distance and + 1-12 for the near, and she was to wear the glasses as constantly as possible. Shortly after putting on the glasses the patient came back to me complaining that the pain was greater with the + 1-18 and 1-12 than it had been with the convex 1-36. She wished to give up the glasses, as they were "too strong for her;" but I assured her that the pain which she had experienced was not because her glasses were too strong, but because they were too weak. I then told her to wear convex 1-12 continuously. After a little while she again returned, saying that the pain had been intense and constant, and that she could not wear such strong glasses. Thinking that the patient might have that intolerance of strong glasses which some hypermetropes of a high degree often show, I determined to reduce their strength. I found now, however, on examination, that the patient had easy and perfect binocular vision, and that a prism base upward gave vertical images throughout the range of accommodation, whereas in my former examination the images were homonymous, 10° in 12 inches. At the distance, however, the images were at times slightly homonymous, and the actual adductive power still preponderated greatly over the abductive, all through the range of accommodation. Thinking that the attempt to maintain binocular vision and the consequent strain on the externi was what had occasioned the pain, by giving rise to muscular asthenopia of these muscles, I encouraged the patient to continue with the glasses. Three months later the pain had almost ceased, while the condition of the muscles was as follows. At 20 feet, with no positive glass, but with the colored slide, there was an insufficiency of the *externi* equal to a prism of 12°. If + 1-18 was added the insufficiency sank to 3°; if + 1-12 then the images are exactly vertical and remain so throughout the range of A. The adduction at 20 feet (with the convex glasses) is 5°, while the abduction amounts to 7°. At 12 inches the adduction is only equal to 8°, while the abduction

amounts to 15°—the preponderance of power now lying two to one with the *externi*, which is exactly the reverse of what it should be in the normal eye. Thus in less than six months, by simply using suitable glasses, binocular single vision was obtained throughout the range of accommodation, and the patient, from having an insufficiency of abductive force of 10° for 12 inches, obtained a positive abductive power of 15° for the same distance—a clear gain in the power of the externi of 25°, as measured by prisms. This gain is no doubt due to the fact that as the ciliary muscle relaxed under the glasses, the tension on the interni which had always been associated with it was also gradually relaxed, thus *pari passu* increasing the power of the externi, even after binocular single vision had been regained.

So great a gain as this in the power of the externi would lead us to fear that the excess of power, at first apparent in the interni, was not due to their intrinsic strength, but rather to the reflected or associated force from the ciliary muscle under the excessive tension imposed upon it in order to overcome the error in refraction.

We cannot but fear that, where the abductive force for the greater part of the range of accommodation is nearly twice as great as the adductive, that the original and intrinsic power of the muscles has been weakened by the operations; so much so, indeed, that we may be justified in fearing that what was originally marked convergent strabismus may, after the operations and with glasses sufficiently strong to relieve the asthenopia, become insufficiency of the interni, or even pass into actual divergent squint.

And this leads me to a practical point upon which I wish to insist with some emphasis, and that is that we are prone, in that condition in which strabismus is most common, hypermetropia, to operate too often and at too short intervals.

As a general thing the most careful of us are satisfied with determining the amount of deviation, the state of refraction, amount of vision and accommodation; that is, we make a careful examination of the eye before beginning with the operations, but this once made we proceed in our attempts to remove by surgical means the deformity; that is, we deliberately attack

the effect without paying much attention to the cause of the squint. The effect removed, we then attack the cause by taking into consideration the error in refraction, and we prescribe glasses after one, two or three operations, as the case may be, not with the design that they may be of any independent value in themselves in removing or lessening the squint, for this has been done by the operations, but simply to prevent a relapse from that condition which has been obtained perhaps from repeated tenotomies.

Most practitioners avoid putting on glasses till the wound of the divided tendon is entirely healed, and then, surprised at the little effect gained, resort to another operation within a period of three or four weeks, or perhaps even follow it with a third. I have myself been in the habit of prescribing glasses almost immediately after the operation; but I have not been aware till lately how important it was not to found the indication for them upon even an exact knowledge of the state of refraction gained before the operation, even by the aid of atropine, but upon data furnished *after* the operation from a careful study of the state of the relative accommodation both for the far and near.

I have seen just such results as those mentioned in the preceding case follow, even where no binocular vision existed, and I dare say there are many more which will ultimately go the same way, the sight of which I shall be spared. Patients who have undergone the various vicissitudes from convergent to divergent squint have usually a disinclination to revisit the author of their woes, but there is none of us who does not from time to time get painful examples of each other's failings. The popular fear so often expressed that the eye "may go the other way," though gradually becoming less on account of improved methods of operating, is by no means extinct, either in theory or point of fact. And although we shall probably never be able to measure exactly the effect of a tenotomy, we can at least do every thing in our power to come as near to it as possible, and thus avoid disagreeable consequences, and one of the best ways of doing this is, I believe, to treat more and operate less. To this effect I would suggest the propriety, in all cases of convergent squint in hypermetropic eyes, of reducing as far

as possible the error of refraction before any operative interference is had at all, for the purpose of removing from the interni, as much as possible, the abnormal tension associated with excessive action of the ciliary muscle. By this means I am certain, from my past experience, that we should in the majority of cases reduce the angle of deviation, sometimes even to a great degree, and thus avoid to a considerable extent those numerous "settings-back" of the muscles so detrimental to the easy and lasting performance of their natural functions.

With this brief outline of the manner in which relative accommodation may behave in actual strabismus, I would call your attention for a few moments to a kindred condition—insufficiency of the externi, which is often provocative of homonymous diplopia and intermittent strabismus. Strictly speaking, weakness of the externi recti where there is no anomaly of refraction is exceedingly rare, while in myopia of the highest degree it is of not infrequent occurrence, and in hypermetropia want of proper abductive power is rather the rule than the exception.

We have seen, in the earlier part of these remarks, that if the tension upon the interni was increased the relative accommodation was displaced toward the near point, and it would naturally be supposed that if the tension on the interni was lessened the relative A., instead of being displaced inward, would be removed outward. Now if the externi are weak, it of course follows that it will require less tension on the interni to make the visual lines intersect at a given convergence than if they offered their usual resistance; and if this tension is lessened, it ought to follow that the relative accommodation will be removed further from the near point than under the normal equilibrium of the muscles. But in all cases of marked insufficiency of the externi which I have examined in emmetropic eyes, the field of accommodation was displaced toward the near point, not, as we should expect, removed from it.

These patients have to hold their book near to the eye, some exceedingly so, and the explanation might be sought in the fact that the externi are not strong enough to resist the interni, and thus obtain a proper crossing of the visual lines at even a moderate distance from the eye. But it must be remembered that

these very patients have the power of carrying out the visual lines to parallel axes, as is shown from the fact that their diplopia is rarely if ever constant, while in some cases it is never, as it were, spontaneous, but can only be called forth by the colored glass. Why is it, then, that these patients, if they can overcome the interni to such a degree as to obtain parallel axes, cannot carry out the visual lines sufficient to allow them to read at a distance greater than 14, 12, or even 8 inches, as the case may be?

The explanation of this is, I think, to be found in the action of the accommodation, or rather in the associated action of the ciliary and the interni recti muscles. Under the tension of the ciliary muscle necessary to make reading possible, there is also a corresponding associated tension on the interni, which has the tendency to turn the eye in, and which is counterbalanced in the normal eye by the opposing tension of the externi. If now for any given degree of convergence at which the object is held, the strain put upon the externi in order to resist the interni, while accommodation is going on, is greater than they in their weakened condition can bear, they must of a necessity yield to the superior force; and the result is that the eyes are thus converged to a point nearer than the object, which has to be gradually brought nearer and nearer till a point is reached where the tension on the interni is so great that the externi, though reduced in power, can resist it. But as soon as the accommodation necessary for distinct vision for a near point is relaxed, and with it the associated tension on the interni, the externi are then able, freed from any opposing force, to carry the visual lines out till they become parallel.

Now although a high degree of convergence is necessary in these cases for close work, of course the tension on the interni is not so great for the same degree of convergence where the externi are weak as where they are of normal strength. Thus we see that the relative accommodation may be displaced inward, even when the tension on the interni for every given degree of convergence is reduced.

In emmetropia it is evident that this displacement inward of the field of accommodation can only take place, to any

marked extent, where the insufficiency of the externi is of a very high degree, because as we approach the near point the effective ability of the externi gradually increases, and it requires but little force on their part to maintain the equilibrium of muscular power at the point ordinarily selected for near work. Still that this displacement may take place will be shown by the following case, which I the more willingly cite as I can find but one other like it on record.[1]

C. B., æt. 17, has complained of his eyes "being weak" for over a year, during which time he has been troubled with the common symptoms of asthenopia. He has been wearing a weak convex glass (+ 1-36), which has given him but slight relief. Latterly all his symptoms have increased, combined with occasional double vision. While reading, the patient habitually holds his book at about 7 inches, but can, with an effort, still read at 12, but not further. The examination gave the following results. Refraction emmetropic (under atropine); V. = 1; A. normal. If one eye is covered with the colored glass then homonymous images follow, separated, as measured by prisms, 30° in 20 feet. These images combine at 8 inches, and at 6 vertical diplopia is obtained by a prism, base up. If the candle is held at 8 inches and then moved to either side of the median line 4 inches, homonymous images follow, the images being always on the same plane. The diagnosis was consequently a large amount of insufficiency of the externi; there was, however, no actual strabismus.

The right internus was now divided, and six days after the operation the insufficiency had sunk from 30° to 10° for 20 feet; homonymous images were present only outside of 10 feet, and at 12 inches the candle could be carried all across the visual field without producing homonymous diplopia. The region of distinct vision for near work has been very largely increased, for whereas the patient could not read before the operation at a greater distance than 12 inches, he now reads as far as the type can be seen by the average normal eye, 3 to 4 feet. Ten days later the insufficiency had risen again from 10° to 18° for 20 feet, and it was not till the candle had approached the eye to 18 inches that the homonymous images combined. The ab-

[1] Klinische Beobachtungen Pagenstecher. Drittes Heft, 1866, p. 96.

duction at 12 inches now amounted to 2°, the adduction to 18°. The left internus was now divided, and the results of the examination made three weeks after the last operation were as follows. If the colored glass was used alone over one eye there was no homonymous diplopia, even for 20 feet, nor did this occur anywhere from the distance up to the near point, even when the candle was moved laterally across the field of vision; but if the prism, base up, was added, a small degree of insufficiency (one or two degrees) of the externi was still apparent. The patient is entirely relieved of his asthenopia and diplopia, and can use his eyes to the full amount without experiencing any inconvenience.

In the above case there are two principal points to which I would particularly call your attention. (1.) That although there was no actual strabismus, both interni had to be divided to restore the muscular equilibrium. (2.) That although the patient could, with an effort, carry out his optic axes to the parallel, the relative accommodation was so displaced inward, when the eye was adjusted for near objects, that distinct vision was not possible outside of 12 inches, while near work was usually performed at 7 inches.

To show that this displacement of the relative accommodation may take place when the insufficiency of the externi is the result of operative interference, I would call your attention to the very interesting case presented at one of the late meetings by a member of the N. Y. Ophthalmological Society. The patient was a young lad of about 12 years of age. In this case there was a total hypermetropia of 1-8, with vision = 1. There was an insufficiency of the interni amounting to 8° for the far and 14° for the near. In order to relieve this both externi were divided at the same sitting. The result of this double tenotomy was homonymous diplopia of so great a degree that single vision was only obtained when the object was brought within 6 inches of the eye. This diplopia gradually became less, till at the end of three weeks it only occasionally manifested itself. The patient's total hypermetropia was neutralized, + 1-8 being given. With these glasses vision was 1, and there was no diplopia. The error in refraction having been completely neutralized, the eye might be con-

sidered as an emmetropic eye, in so far that, when in a state of rest, it was accommodated for parallel rays, and consequently had to call forth only that amount of accommodation for a given convergence that a normal eye would; and yet the relative accommodation was very different from that of an emmetropic eye, it being displaced so far inward that the patient could not read outside of 14 inches, while a boy of his age, with vision 1, ought to be able to read common print at 3 or 4 feet.

It would be advanced at once in such a case that the externi had been so weakened by the operations that they had not strength enough to carry out the visual lines, so as to make them intersect at a distance greater than 14 inches. But why have not they the requisite force for this, if they have sufficient to produce parallel axes, which requires a great deal more strength? The only answer to this, that I can see, is the one already given, with a repetition of which I will not weary you.

A further examination showed that the actual abductive power remaining after the operations was, expressed in prisms, only 3°, which is a trifle less than one-quarter what it should be, while the adduction was only 6°, which is also only about one-quarter of what it is in the normal eye. The relative far point for reading is at 14 inches, while the near point is at 6, making the relative accommodation about 1-12, which is certainly one-half, if not one-third, what it should be. Thus we find, in a high degree of hypermetropia, a condition brought about which not unfrequently occurs in exaggerated forms of myopia, where an insufficiency of the externi coexists with that of the interni, together with a reduction of accommodative force.

This reduction in the power of the muscles presiding over the accommodation would lead, we might fear, to some form of asthenopia, either from the ciliary, interni or externi muscles. The fact, however, that notwithstanding the great reduction in force, the proportion between the abduction and adduction remains nearly normal, is very favorable, for if the actual power of both interni and externi increases, the muscular equilibrium between them will probably be maintained.

Although we very rarely find actual insufficiency or even a

reduction of abductive force in emmetropic eyes, in hypermetropia, on the contrary, it is so common as to be in fact the rule. This led Giraud Teulon to express the belief that there is the same inherent tendency in hypermetropic eyes toward weak externi that there is in myopic eyes toward weak interni. Now wherever there is a tendency so strong as to amount almost to a law there must be some cause for it, and the chief causes why the abductive force is abnormally low in hypermetropic eyes are, I believe, two. (1.) That the associated tension of the ciliary muscle in overcoming the error in refraction gives an increased amount of power to the interni. (2.) That the effective force of the externi is *per se* also lessened by the anatomical construction of the hypermetropic eye. In the normal eye, as you are well aware, the externus is inserted further back than the internus, which, in itself, other things being equal, gives an advantage to the interni, and this advantage is disproportionately increased in the hypermetropic, because from the shortened antero-posterior axis the centre of rotation, though relatively more posterior, is more on a plane with the insertion of the muscle, which for this reason has less leverage than in the normal eye.

This want of abductive force may be either actual or apparent. If actual, it depends on some want of power in the muscles themselves, and may be occasioned in three principal ways.

(1.) Through an abnormal preponderance both of volume and force of the recti interni over the externi, which may in themselves be below the normal standard. This condition is generally inherited from parents who have themselves squinted, and in whom, in consequence, the interni have become from constant exercise unduly developed, while the externi, from want of use and from being constantly on the stretch, have lost both volume and vigor.

(2.) From faulty insertion of the muscles, on account of which the interni have the preponderance of power.

(3.) From a state of debility, either temporary or permanent, which has been developed by a constant straining on the part of the externi in order to maintain binocular vision, while the eye is calling forth its accommodation in order to neutralize the error in refraction.

This latter depends on the intimate relation which exists between convergence and accommodation, and which has been more fully dwelt upon in the earlier part of these remarks.

It is evident that in these cases where there is inherent weakness, be it natural or acquired, in the externi, the correction of the error of refraction, though it may give relief, will not remove the whole cause of the trouble; and this is one of the reasons why some hypermetropes, even when provided with suitable convex glasses, still continue to suffer from asthenopia.

Instead, however, of being actual, this insufficiency of abductive force may be only apparent. When it is so, it is due entirely to the efforts of the accommodation to overcome the error in refraction, and disappears as soon as this is corrected by glasses. This will be better explained by an example.

A patient has Hm. = 1-16, Ht., as estimated by the ophthalmoscope, between 1-10 and 1-12. If the condition of the muscles is examined at twelve inches from the eye without the hypermetropia being neutralized by glasses, then the amount of adduction is found to equal a prism of 20°, while the abduction amounts to only 4°. But if the error of refraction is corrected, then the amount of adduction rises to 15°, while the abduction in this particular case undergoes but little change. It is, as a rule, however, slightly decreased.

This shows that the disproportionately low force of abduction is due in this and similar cases not to any idiopathic weakness of the muscles themselves, but to the fact that the nervous impulse, by which the ciliary muscle is able to overcome the error of refraction, is propagated to the interni, which thus throws the balance of power in their favor, and gives them, as long as accommodative efforts are going on, the preponderance of force. From which it follows that the tension on the interni can only be relaxed in these cases by relaxing that of the ciliary muscle. This, as a rule, the unaided eye refuses to do, for the reason that distinct vision would have to be given up. When, however, the hypermetropia is completely neutralized, the undue tension on the ciliary muscle is removed, and, as a consequence, that on the interni. The abnormal resistance which these latter offer to the action of the externi is thus re-

moved, and these muscles are then left at liberty to bring forth their power in order to maintain binocular single vision, as soon as this is threatened by placing prisms before the eyes with the angle outward.

It often happens that the effect of glasses in increasing, at least to its fullest extent, the abductive force in hypermetropic eyes, is not always obtained at once, even in cases where the externi are not idiopathically weak. It often takes some little time for the eyes to give up the exercise of a certain amount of tension, the employment of which habit has rendered instinctive.

On account of this low degree of abductive power an examination should be made (after the hypermetropia has been neutralized as far as possible) into the condition of the muscles, and if a marked degree of insufficiency of abduction is shown, a tenotomy is, in my opinion, not only justifiable, but necessary, notwithstanding the fact that no actual strabismus exists, and the weight of Donders' opinion against it. The cases requiring operative interference will, of course, be comparatively rare, and the tenotomy must be done, not with the idea of dispensing with the proper correcting glasses, which was Donders' chief objection to it, but with the aim of restoring a normal equilibrium to the muscles.

The next subject which I shall call your attention to, and which I have now only time to briefly touch upon, is the action of the relative accommodation in divergent squint and weakness of the interni, and, as it is in myopic eyes that these affections most frequently occur, my remarks will in a great measure be restricted to that condition.

In myopia the relative accommodation is displaced toward the near point, which is exactly the reverse of what it is in hypermetropia, or, what amounts to the same thing, the proportion of accommodative force actually used is always greater in myopia than in emmetropia; consequently the tension on the ciliary muscle is always less, while that on the interni is, from the shape of the eye, always greater for a given convergence than in the normal organ. From this it results that the abductive force is, as a rule, disproportionately great; and, as you are well aware, the first indication in the treatment of in-

ERRATUM.

Page 40, seventh line from bottom, for "greater," read "less."

sufficiency of the interni is to restore this want of adductive power, by lessening the load which the myopic formation necessarily imposes upon them. The different methods by which this is accomplished, such as tenotomy, the use of prisms and the carrying out the far point by concave glasses, are too familiar to you to need or even to permit any extended comment from me. Still I cannot help thinking that, in practice at least, the important service which suitable glasses may be made to render in preventing the tendency to deviation outward shown by myopic eyes has been much underrated; and in this connection I should like to say a word or two in regard to the effect which concave glasses have on the relative accommodation, through which, I think, their utility in a great measure depends.

As a tendency toward an abnormally great convergence is the chief characteristic of hypermetropic eyes, it must naturally follow that the nearer we reduce a pair of eyes to this condition the greater will be the tendency toward increased convergence of the optical axes; consequently if we have myopic eyes with a tendency toward divergence of the optical axes, we must reduce them to the conditions offered by hypermetropia. This is done in two ways. (1.) By altering the refractive and accommodative condition. (2.) By changing the anatomical ones.

If by means of concave glasses we neutralize myopic eyes, we have, as far as the refraction is concerned, reduced them to a condition of emmetropia, and if the accommodation was good it would be fair to suppose that such eyes would be equal also in muscular force. But this, as Donders proved long ago, is not the case, for in carrying out the far point we have also displaced the relative accommodation outward, and thus in reducing it by glasses to an emmetropic eye for the distance we have changed it for the near into a hypermetropic eye, as far as the accommodation is concerned; that is to say, an increased degree of tension of the ciliary muscle is demanded with small degrees of convergence, which is just the reverse of what it was before the M. was neutralized. Now allowing that the increased tension of the ciliary muscle in overcoming the glasses is propagated to the interni, in carrying out the far

point we have not only decreased the amount of tension demanded of them by lessening the convergence, but we have also increased their effective ability for that convergence.

This will be made clearer by an example. Suppose a myope of 1-7 habitually reads at his far point, that is, at 7 inches. Under these conditions he is using a considerable amount of the tension of the interni with the minimum amount of accommodation, or even with no accommodation at all (Donders). If now we carry out his far point by neutralizing completely or partially his myopia, but so that he can still read with ease at 15 or 16 inches (his near point being no longer at 3, but at about 6), we have by thus reducing the convergence reduced also the amount of tension on the interni to a very large degree. But beside this, by compelling the ciliary muscle, which was formerly idle, to exert its tension in overcoming the glasses, we have gained that amount of force which through its action is always transmitted to the interni. That this is true is proved from the clinical fact that the average adductive force of myopes, who from an early age have worn glasses sufficient to neutralize their myopia, is much greater at their point of near work, and the tendency to deviate outward much less than among those where the error in refraction has not been corrected. For this reason, when in myopia there is any insufficiency in the abductive power, I always make it a rule, whether a tenotomy has been performed or not, to neutralize the myopia, or to come as near this as circumstances, such as the state of the accommodation, amount of vision and age of patient, will permit.

In regard to the second method of relieving the overburdened interni, that by tenotomy, I should have something to say, both as to the indication for and performance of the operation, did not want of time compel me to postpone it till some future occasion.

In conclusion, I would say that the object of these I fear already too extended remarks has been to call attention to a part of the subject of strabismus which has not yet received the attention which I think it deserves. And it is in this connection that I would suggest that we have hitherto in our treatment of squint paid too much attention to the condition

of the recti interni and refraction, and not enough to that of the externi and accommodation.

Test Types and the Power of Perception. By B. Joy Jeffries, of Boston.

I agree with Dr. Green in the correctness of the principle on which is based his new series of test letters, published in the Transactions of the Society, 1869. Either the printing or the lithographing of the sheet accompanying this number of our Transactions is so poor as to seriously affect its utility. I used one in the following experiments, which fact may have had an influence on *some* of my results. I do not agree with Dr. Green that it is a good plan to make the spaces between the lines proportionate to the height of the letters. I found, in carefully testing, that they should be wide apart, and their closeness on the card interfered with their being perceived. These causes rendered them not so distinctly perceived as Snellen's of the corresponding size. I would advise the last six lines of letters being cut apart and separated out on another card or the back of the same.

Visual perception is so much a mental act that, of course, all answers from test letters have elements of error in relation to the condition of retinal impression. Every thing which affects the two elements of sight, namely, retinal impression and mental perception, affects the distinguishing test types.

I have often felt a doubt whether the reading XX. at 20 feet in a fair light was a strict enough test. In general we should be satisfied if a patient, after choroiditis or iritis with syn. post., read for us XX. at 20 feet, and Jäger No. 1 at 10 inches. Yet this, for me, would be a reduction of vision to less than one-half. In comparing Dr. Green's with Snellen's test text, I endeavored to see how far above normal, or XX. at 20 feet, I could go. The following results were from three separate trials, on three several days, when not feeling below par in general sensation of health. My examination of recruits (not drafted men) during the late rebellion had taught me how much vision might vary in the same individual within a short time from mental or cerebral causes.

The same man who the day after a "spree" could not read my Snellen XL. or L., would come back the day following and read XX. fluently. Therefore I selected days when the eyes and body were, so to speak, normally used. In testing patients I employ the same Argand gas-burner and partly darken the room, generally using black on white. Standing at exactly 20 feet, and avoiding mental and physical interruption—I mean thinking of nothing else—holding the head still, the eyes carefully fixed and not irritated by side light, I succeeded in reading Snellen XV. H, R and U were not good letters to distinguish. I read Snellen XII., except S = N. I use the sign of equality to signify that they could not be distinguished from each other. Of Snellen X. I read V, Z, O, U, Y. A and B were bad, and P = F, also H = K = R. Snellen's VIII. was the lowest I could read any letters of at 20 feet. I read C, L, T, V = Y. If a cataract patient, after operation, read as many letters of XX. at 20 feet I should be satisfied.

Of Dr. Green's new card I read down to X. without much difficulty, at 20 feet; XVI., pretty fluently; XIII., O = C = G. P is bad. Some of the letters of X. I could make out, but none of VIII. The nearness of the lines to each other and the want of good printing, as also the numbering of the lines over the letters, interfered with my perception of them. The result, as is seen, was not so good as with Snellen's text.

Out of doors, with sunshine on the card and I myself in the shade, I found I could do better.

Snellen's VIII. I could mostly read at 20 feet. } I mean some letters
" X. " " " 23 " } bothered me
" XII. " " " 32 " } as before.
" XV. I could fluently read at 32 feet.
Green's X. at 23 feet.
" XVI. at 32 feet, not so easily as Snellen's XV. at same distance.
Snellen's XX. at 53 feet I could decipher.
" XXX. at 53 feet I could read easily.
Green's XX. at 32 feet.
" XXXII. fluently at 53 feet.
" XXV. just make out at 53 feet. They were confused.
" XX. not at all at 53 feet.

This gives me a varying V. of 20-8, 23-10, 32-12, 32-15 + by Snellen's card, and a varying V. of 23-10, 32-16, by Green's card.

My V. for Snellen's XX. and over was 53-20 —, 53-30 +.

My V. for Green's " " " 53-32.

Black letters on a white ground not only looked larger from irradiation, but were more distinctly perceived in detail in daylight, V. = 53-20. Dr. Green's plain Gothic letters were not so good as the finished letter—I mean L with a top to the perpendicular and upright to the horizontal line, E finished, so to speak, etc.

The colored XX. of Snellen I tried by gaslight, which gave, of course, a yellowish tinge. The red was most striking and seemed *at first* to be most readily perceived, but this was not the case. The yellow was most correctly and easily distinguished in detail. These letters are on a black ground.

In reference to my power of visual perception I should say I have not generally found it *much* above *practiced* emmetropes, and have regarded my eyes as normal. I have never perfectly paralyzed my accommodation to find Hl. At 20 feet I was conscious of a sensation of accommodation for the letters below XX. I was too busy to test this by total atropine paralysis of the ciliary muscles. Above these I perceived the letters readily with relaxed muscles, turning from looking at a distance. This amount of accommodation seemed difficult to hold to, as if it was so small that it was not sustained with steadiness. With complete relaxation and + 1-80 my vision was almost the same as without any glass; + 1-60 was too strong. My accommodation seemed, therefore, about = 1-80.

I had purposely avoided being, so to speak, mentally familiar with these letters from their constant presence to the eye in my office. I attempted no record when I had learned them, and could easily detect this familiarity.

Now, I would ask, is my vision very much above the average? If not, then these tests are not up to the requisite niceness. I do not mean by this that we are likely to make a gross error of diagnosis or prognosis by their use, but simply would warn against mistakes. In conclusion, I would say these experiments caused a degree of mental irritation as well as ocular fatigue, which will render me more lenient toward my unfortunate patients undergoing the extraction of astigmatism, for instance.

Monocular Glaucoma supervening on Binocular Retinitis Hemorrhagica. By D. B. St. John Roosa, M. D., of New York.

Mrs. R., æt. 60, a delicate but active lady, consulted me May 19, 1869, in regard to her vision, and gave the following history. About two years before, while riding in a very severe wind on a cool day, the patient suddenly experienced a blurring sensation before both eyes, accompanied by some pain. On getting home she found that she was unable to read or sew, and that her eyes would not tolerate a bright light. The condition of the eyes slowly improved, so that the patient was able to bear the light and engage in ordinary occupations not requiring much use of the eyes, but not to read or sew. On December 25, 1868, an exposure similar to the one above described occurred, followed by the same symptoms, viz., pain, loss of sight and photophobia, in an aggravated form. She has felt herself obliged to stay in a dark room since the last attack, although she has just made a journey of about 250 miles in reaching New York. The treatment pursued has been mainly the use of blisters behind the ear, alteratives, rest and avoidance of the light. On examination the eyes are found somewhat sensitive to light, but not excessively so. Right eye, V. = 1-20; left, 4-20. Tension slightly increased. Great venous engorgement and numerous traces of suffused blood in the retinal vessels. Nerve entrance excavated; a decided sense of fullness in this eye is complained of by the patient, while in the left no such feeling is experienced. The left eye showed the usual evidence of neuro-retinitis; no excavation of the optic nerve entrance.

I suggested to the patient that an iridectomy be performed on the right eye, and that a tonic course of treatment be adopted, with a return to the enjoyment of sunlight, having the eyes protected by blue glasses. I informed her that I only hoped to stay the progress of the disease in the right eye, which, without interference, must go on to absolute blindness.

I then sent the patient to Dr. H. Knapp for his opinion, which he gave as follows: "In the left eye, apart from

cataracta incipiens, I find the traces of neuro-retinitis being now on its progress to a certain degree of atrophy of the optic nerve; tension normal.

"In the right eye there is a high degree of venous engorgement of the retina, numerous retinal apoplexies, and excavation of the optic disk. F. normal, T_1; pupil perfectly responsive. My opinion is that apoplectic retinitis was caused in both eyes by a drive in the cold wind. In the left eye it ran its usual course; in the right it underwent the rather rare but very unlucky complication with glaucoma."

Dr. Knapp advised an iridectomy in the right eye, which I performed on the 21st, using an anæsthetic, and being assisted by Dr. C. E. Hackley. A broad segment of the iris was excised without difficulty, and very little reaction followed, the wound healing very well. The subjective sensation of fullness in the eye was immediately relieved by the operation and continues so. The vision remained the same; the eye was not examined by the ophthalmoscope after the operation. The patient returned to her home at Sacketts Harbor, N. Y., eleven days after the performance of the iridectomy.

A note from her son, in October, states that the vision had not decreased any; that the patient's general condition is much improved, so that she goes all about, to church, and so on, while at the date of the operation she felt that her sight was failing quite fast.

A Modification of the Ophthalmoscope. By Edw. G. Loring, M. D., of New York.

The modification of the ophthalmoscope which I now present to the Society is intended to facilitate examinations by the upright image, and to expedite the determination, by this method, of existing errors in refraction.

The principal feature of the modification is the substitution of detachable cylinders for the fixed Rekoss disk now common to a number of ophthalmoscopes. In the present case but three cylinders are employed, though these might be multiplied indefinitely was there any occasion for so doing. Each cylinder is pierced for eight glasses, forming in the aggregate the following series:

Convex..... 0, $\frac{1}{48}$, $\frac{1}{24}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{7}$, $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$.

Concave..... $\frac{1}{48}$, $\frac{1}{24}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{7}$, $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$.

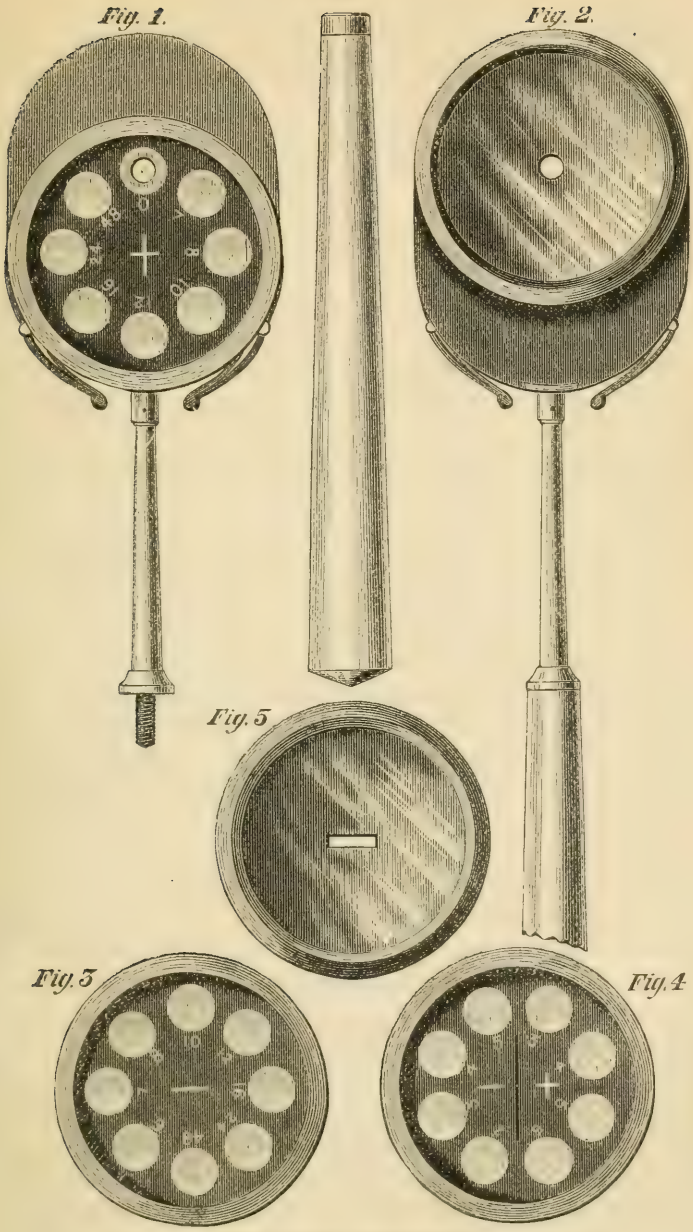
Thus we have a series of glasses extending, with but comparatively slight differences in focal value, from convex 1-48 to 1-3 and from concave 1-48 to 1-2.

The manner in which the glasses are divided among the cylinders will be readily understood from the accompanying drawings. The first cylinder is made up entirely of convex glasses, by means of which all ordinary degrees of hypermetropia can with sufficient exactness be determined. One hole (0) is left vacant to represent emmetropia, without the necessity of removing the cylinder, and for examination by the inverted image without an eye-piece; should, however, the latter be desired, the observer has a large selection at his command. The second cylinder contains the concaves of moderate focal power, and the third is composed of the high numbers, both positive and negative. These strong numbers are designed for the determination of the highest degrees of errors of refraction and for the measurement of the inequalities of the fundus, such as excavations and elevations of the optic nerve, projections of tumors, retinal detachments, membranes in the vitreous, etc. With the stronger convex, such as 1-3, opacities of the cornea and lens can be viewed under considerable enlargement.

The cylinders fit into a cell at the back of the instrument and are held firmly in their place by means of the two small springs shown in the engraving, which, projecting into a groove in the side of the cylinders, prevent these from falling out, yet do not interfere with their rotation. In turning, the centre of the glass comes opposite the centre of the hole in the mirror.

Great care was taken to have the mirror, which is concave, seven inches' focal distance, ground exceedingly thin—as thin almost as a metal mirror—while all the surrounding brass work is so beveled away that as little impediment as possible is offered to the passage of the rays, thus rendering the image perfectly distinct, and I think unusually brilliant.

The mirror being contained in a separate case of its own is made detachable from the rest of the instrument, which can then be used as an optometer, the patient himself revolving the



EXPLANATION OF DRAWING.

Fig. 1. Back of instrument with cylinder in position.
Fig. 2. Front view of instrument.
Figs. 3 and 4. Remaining cylinders detached.
Fig. 5. Astigmatic optometer and mirror.

cylinder till the suitable glass is obtained. As the perforation through which the patient looks when the mirror is removed is equal to the diameter of the glass (three lines), and is much larger than the normal pupil, the peripheral rays are not cut off, which is usually a source of error when smaller diaphrams are used.

The handle of the instrument has purposely been made unusually long, so that the observer's hand shall not interfere with an easy and close proximity to the observed eye, which is a great advantage in examination by the upright image.

The instrument, the three cylinders, and a convex two and one-half inch lens for examination by the inverted image, are all contained in a small pocket-case, measuring four and three-quarter inches by two and one-half square by three-quarters thick.

Beside the common concave mirror which comes with the instrument, I have had two others constructed which may not be unworthy of mention. The first is intended for examinations by the "weak illumination," and is precisely similar to the common concave 7-inch mirror, silvered on the back, only it is made from London smoke instead of colorless glass.

As it is the property of London smoke glass to simply reduce the quantity of the transmitted light without sensibly altering its color, it occurred to me that any degree of illumination might be obtained by using various shades of the glass, without sensibly changing the appearance of the fundus. I have made many experiments with these mirrors and have finally settled upon two as the most serviceable. One is even weaker than the three plates of plane glass—so weak, indeed, that the patient is hardly aware that any light is thrown into his eye. The other is made from a much lighter shade and gives a reflexion intermediate in brilliancy between the ordinary weak and strong reflectors. By its means a much more brilliant picture is obtained than with the plane glass mirror, while at the same time with much less glare to the patient than with the ordinary silvered one. The advantages of these mirrors are that the quantity of light can be varied and that they can be so easily kept clean. The common weak mirror, consisting of three plates of plane glass, could, however, be easily fitted to the instrument, should it be desired.

The remaining mirror mentioned above was originally designed for a stenopæic slit to be used with the instrument when employed as an optometer for the determination of astigmatism. It consisted of a thin plate with a slit in it, whose length was equal to the diameter of the perforations in the cylinder. This was mounted like the mirror, and made to fit in the mirror cell in which it revolved, so as to allow the slit to correspond with any given meridian of the cornea. The meridian once determined, the patient turned the cylinder till the suitable glass was obtained. This plate was subsequently made with a polished surface in front, and was thus made to serve also as a mirror for determining, by means of the ophthalmoscope, the amount of astigmatism in the principal meridians of the eye.

In conclusion, I would take this opportunity of informing those who are desirous of obtaining this instrument that it can be had of its maker, H. W. Hunter, Optician, 1132 Broadway, N. Y. City.

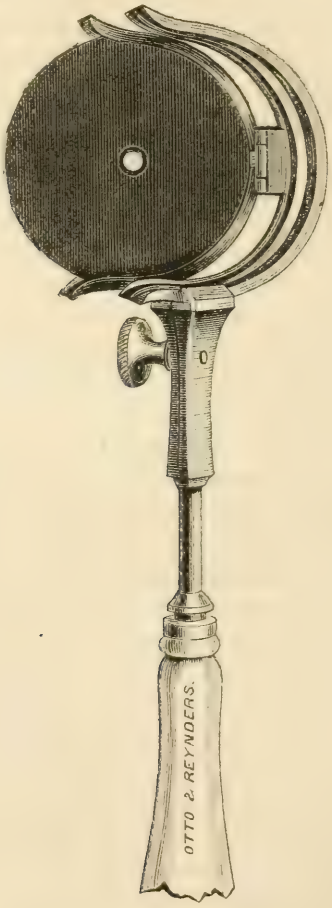
A Modification of the Ophthalmoscope. By Henry D. Noyes, M. D., of New York.

In employing the direct method of examining the fundus, I have been embarrassed many times by the want of a suitable number of glasses to correct the patient's refraction. Jaeger's ophthalmoscope supplies the largest number, but these are insufficient. I have become so much addicted to the use of the upright image for inspecting the fundus, and for estimating the state of refraction, that I contrived the following instrument to enable me to employ all the glasses of the trial-box, as the exigencies of any case may require.

I wish to be able to use a mirror, and, if needful, both a spherical and cylindrical glass. I may remark that, in many instances, the reflection from a concave lens is quite sufficient to illuminate the fundus at the same time that it corrects the possible myopia of a patient. The light is feeble, but sometimes adequate.

My contrivance consists of three forks, or clips, which make a little more than the semi-diameter of a circle, and are grooved for the reception of either a glass or the mirror. The

three clips are placed in a slot, which may be tightened or loosened by a screw; they may thus be turned around to the amount of a half circle. All move together, and are supported upon a handle, which should be 5½ inches long. Two of the clips are precisely alike; in these the glasses are usually inserted. The front clip has at its middle a hinge, and is intended for the mirror.



I use a plane silvered mirror, the sight-hole being bored through the glass. Such a mirror, it has long since been shown, is eminently adapted to the employment of the direct

method, while for the indirect method a concave mirror of 7 to 10 inches' focus is more suitable. In this contrivance the mirror may be made virtually concave by putting it in the middle clip and setting in front of it a convex lens of 7 to 10 inches' focus. So far as this lens becomes an eyepiece, its influence may be modified at pleasure by putting behind the mirror a concave lens.

The chief advantage of this contrivance is in the fact that all the trial-glasses may be put in use for the upright image. The reason for providing the front clip with a hinge was to give greater accuracy to an examination for astigmatism. When no astigmatism exists it is most convenient to have the clips held at their middle by the slot; the opening of the forks is then upward, and the instrument may be used by either eye at will, without change. But if there be astigmatism the necessity of holding the mirror obliquely influences the effect of the correcting glasses. I therefore hang the mirror on a hinge, so that it may be set to the obliquity which the position of the lamp requires, and the observer may look straight through the correcting glasses.

The cut presents the instrument set for examination of the right eye by the observer's right eye; to look at the left eye, the lamp is placed at the left side of the patient, and the clips are turned around so that the top becomes the bottom. Whatever rotation the cylindrical glass may require to bring its axis to coincide with one of the principal meridians, may be done by simply moving it in the groove of its own clip.

Having used this contrivance for several months I have found it exceedingly convenient. It enables me to diagnosticate errors of refraction irrespective of the patient's amblyopia, with an accuracy and comfort which, with fewer glasses at my disposal, was previously impossible. How important is this kind of investigation to supplement and sometimes correct the results obtained in the usual way, all skilled ophthalmoscopists appreciate. For instance, in great hypermetropia, which often has accompanying amblyopia, the absolute H. it may be difficult to get without prolonged use of atropine. The observer's eye, armed with the trial-glasses, can soon tell by exploring the retina when the full correction is secured.

It is well known that the accommodation of hypermetropes is almost always relaxed, without atropine, during an ophthalmoscopic examination.

The simple contrivance which I present is properly an appurtenance of the box of trial-glasses. They are complementary to each other. I use the trial-glasses made by Nachet, which are set in frames, and each has a handle, so that the glass does not become soiled by the fingers. I do not now care to descant at large upon the great advantages of the upright image in ophthalmoscopy, but simply offer this instrument to facilitate this mode of examination, and know that it will soon commend itself to the hearty adoption of any who will give it a fair trial.

If the observer be emmetropic he needs no correcting glass for himself, if he will relax his own accommodation—and this is made much easier by looking with *both* eyes open and keeping one's visual lines parallel. On the other hand, if observer and patient both be emmetropic, I prefer to use a — 24 for the inspection of the optic nerve, because by relaxing accommodation the *lamina cribrosa* is sharply defined, and by using A 1-24 the retina and surface of the disk are perfectly seen. I am tempted to add that a true test of accurate perception of the fundus and estimation of the refraction is not to be found in the large retinal vessels, but in the very small ones, and still better in the stippling which is produced by the choroidal epithelium.

An Improved Eye Speculum. By Henry D. Noyes, M. D., of New York.

I beg leave to exhibit to the Society a form of eye speculum which I have been using for several months. Before presenting it, I call attention to a considerable number of such instruments, which show the modifications which have been contrived for meeting the indications necessary to the full attainment of the purpose in view.

What is required in a speculum is to separate the lids to the fullest possible degree without causing injurious pressure, directly or indirectly, on the globe, and without becoming itself an embarrassment to the operator.

The first indication, the separation of the lids, is usually obtained by the action of a spring, separating the blades in a vertical plane. The movement of the upper lid is not of this kind, but describes the arc of a circle as it slides over the convexity of the globe. It is difficult to imitate this action in a speculum and obtain a sufficient extent of motion. An attempt of this kind is exemplified in an instrument which I had made in London, in 1866. The blades are connected with a curved bar made of aluminum, and the movable one travels upon the bar by means of a rachet and pinion. The bar is the arc of a circle of a radius of about two inches, and is placed at the inner canthus.

The chief objection to the instrument is, that it does not open the lids as widely as is desirable, especially when the eye is deep in the orbit. It is, however, an efficient instrument, and has the advantages of lifting the lids off the globe, of being out of the operator's way, and of holding the lids asunder at any desired point within its range. It seems to enjoy considerable popularity in London, judging from the remarks made upon it in Mr. Wells' treatise on the diseases of the eye, p. 258.

The second indication, to avoid direct or indirect pressure on the globe, is of the utmost importance in iridectomy and cataract extraction. In the first place the instrument must be light; in the second place the separation of the blades must be capable of restraint, so as not to press on the eye by dragging on the conjunctiva. The bar thrown across the arms of the speculum and set screw make a reliable check. In some cases the bar is single, in others it is cut in halves, which slide past each other. Another and simpler check is a flat loop of wire thrown across the arms, and which can be fixed at any point by means of notches cut in the arms. When the speculum expands most the loop is nearest the spring and least in the way.

The third important indication is that the instrument shall not be in any respect a hindrance to the operator. To fulfill this indication some have been made to work across the nose. The objections to them are that they must be of large size, and are consequently awkward to carry in a case; and, beside

this, they are not held in place by the eyelids as well as are those which have the spring on the temporal side. The reason for this is the anatomical fact that at the inner side of the globe the conjunctiva bulbi passes quickly over upon the lids and makes a shallow *cul de sac*, both above and below; on the other hand, at the outer canthus the *culs de sac* are deep, and retain the blades in place much more readily.

For these reasons it is better to have the spring on the temporal side. In this case the arms must be strongly bent so as to make them lie closely to the temple. This puts the transverse bar pretty well out of the way, but leaves the set screw standing up enough to interfere sometimes with the handle of the cataract knife when the section is being made. This objection I tried to obviate, as you see, by laying the set screw in a horizontal position. It then becomes a little troublesome to seize the head of it.

Without wearying you by showing any other rejected instruments, I exhibit the one which I venture to commend to your acceptance.

Fig. 1.

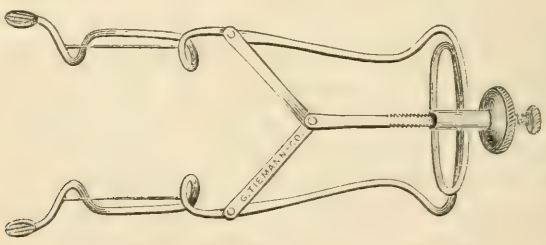


Fig. 2.

It is made of moderately tempered steel, electro-plated with either gold or nickel. It is both light and strong. Its blades open by a spring on the temporal side, which is so strong as to overcome the efforts of the orbicularis even when it contracts vigorously. The check to the expansion of the blades

is found in a Y-shaped attachment to the upper side of the arms. The extremities of the Y are pivoted to the arms and to the stem, so that it has three joints. The stem is prolonged backward beyond the spring, and runs through a short tube soldered to the spring. A triple thread is cut on the stem, upon which a milled head runs easily and quickly. The head may be set at any point of the screw and effectually stops the expansion of the blades, but does not hinder the closure of them by the fingers of the operator.

Working in this manner and occupying this position, this part of the apparatus is completely out of the way and is effectual in its purpose. I find myself in an operation subject to no embarrassment by reason of the interference of the speculum.

The chief indications I have mentioned are thus fulfilled, but some other advantages should be secured, if possible. It is important to be able to take the speculum out quickly, as, for instance, if when taking an anæsthetic the patient begins to vomit, or in case of loss of vitreous. This may be done without any delay by catching the extremities of the blades, which are for this purpose provided with small, flat buttons, roughened on their outer side. Thus closing the blades with one hand, the other hand will quickly and smoothly lift out the instrument. It is not needful to loosen the screw, as in other specula.

Another point to be attained, if practicable, is to keep the eyelashes out of the way. In Mr. Lawrence's speculum this is done by putting a thin metallic plate on the blades and making them solid. I have discarded this plate, because it takes up room and limits the area in which we are to operate. I keep the cilia aside by a small wire thrown across the blades from end to end.

I have lately observed that, when it is necessary to seize the globe below the cornea with the fixation forceps, the wire to keep back the cilia interferes with the forceps. The cilia of the lower lid almost never hinder an operation. I have therefore had the wires made movable, and to be inserted into holes so as to apply only to the cilia of the upper lid, and that for the lower lid may be taken out.

To introduce the speculum the blades should be pinched together by the fingers of one hand seizing the little knobs on the nasal extremities; it is adjusted in place by the other hand, and the screw set to the position at which it is desired to keep the blades open.

The one thing to be remembered in handling the instrument is to shut it by catching its inner extremities; by doing this it will not be liable to rotate in the fingers and make sudden pressure on the globe, as it might if caught by the arms at the outer portion.

I am able with this instrument to accomplish as much as can be expected from a speculum. It is adapted to almost all variations in the depth or prominence of the globe. A very few cases occur in which the globe has sunken to an extreme degree into the orbit and carried the eyelids with it. Inasmuch as a speculum always rests on the bony edge of the orbit and cannot enter far into its cavity, in cases of extreme marasmus and consequent retreat of the globe a pair of elevators may be shaped so as to expose the cornea more perfectly than can a speculum. On the other hand, if the globe is very prominent a speculum rests directly on it, and not on the edge of the orbit. Perhaps it will then be better to dispense with instruments and trust to the fingers of an assistant, because the cornea will be very easily exposed.

With these exceptions, I decidedly prefer to employ a speculum rather than to rely upon an assistant. The fingers of the most skillful assistant or the proximity of his person crowd the operator more or less. An unskillful assistant is constant cause of anxiety, and has too frequently damaged or ruined the result of an operation.

A New Form of Cataract Knife. By Henry D. Noyes, M. D., of New York.

At the last meeting of the Society I stated, in some remarks on the operation for cataract by Graefe's method, that I had some objections to the very narrow knife employed by Prof. Graefe, and had consequently adopted another. I still adhere to the opinion then expressed, and regard the matter of suffi-

cient value to bring it again to notice, and offer a woodcut of the knife.

The blade has a straight back and convex cutting edge for one-half the distance from the point. The convexity is the arc of a circle having a radius of four inches. In the back half of the blade the front and back are parallel, and the width is three millimeters. This maximum width is not attained until you go back from the point sixteen millimeters. The total length of the cutting edge is thirty millimeters. The blade is very thin, is double-edged for some distance from the point, and the latter is extremely sharp. When the counterpuncture is made, supposing the length of the wound in the sclera measured in a straight line to be twelve millimeters, the width of the blade at the puncture is two and a half millimeters.

The qualities which recommend the knife to my use are, that it penetrates with much more ease than any other which I have used; the cut is more smooth than by the narrower knife, because the blade cuts faster, and less tissue remains to be divided after counterpuncture has been effected; the width is not too great to prevent easy manipulation of the blade when in the anterior chamber—that is, rotation of the blade on its axis; there is very little tendency to escape of aqueous humor; the cut is completed with less of the pushing and withdrawing which I have found needful with Graefe's knives; in consequence of the great facility of penetration the fixation of the globe is easier, and the eye has less tendency to turn inward as the puncture and counterpuncture are being made.

I have had the handle made a little thicker than usual, and octagonal, being of about the form of the handle in Weiss's cataract needles.

An experience of sixteen months has confirmed my first impressions of the value of this form of blade, and some of my colleagues in the New York Eye and Ear Infirmary share my opinion. I am aware that at the late Ophthalmological Congress in Heidelberg some expressed a desire to make the

knife still narrower than Graefe at first proposed. There may be those whose difficulties, like my own, have been of a sort to require a remedy of a contrary character.

In the woodcut it may appear that the back of the blade has considerable thickness; this is not a correct representation, because it is extremely thin.

A New Method of Applying Pressure to the Eye. By E. Dyer, M. D., of Philadelphia, Pa.

The value of pressure on the eye in certain cases is so well recognized that I need make no excuse for offering the following paper. I think it may be more extensively used and more efficiently applied than has heretofore been generally supposed.

It was with the object of learning how far pressure could be used to advantage, and how it could be best employed, that I undertook the experiments which led to the construction of the instrument here described. The common compressory bandage, either flannel or knit, is open to many objections. Its elasticity varies with the quality of the stuff, and the manner in which it has been washed. It is liable to slip, and in most cases its readjustment must be left to an assistant.

To pack the orbit properly requires not only skill, but time and patience. Moreover, there are cases in which pressure is indicated, but in which the heat caused by the packing presents an insuperable objection to its employment. The necessity for frequently renewing the packing in cases where there is much discharge from the eye is also a serious objection.

The degree of pressure used cannot be accurately estimated, but will be at some times greater and at others less. In fact the surgeon never knows what pressure is exerted, but must depend entirely on his own sense of touch and on the sensibility and intelligence of his patient. Moreover, it is utterly impossible for him to convey to others an exact idea of the compression desired. Also in recording or reporting cases, no exact estimate can be made of the amount of pressure employed.

It is obvious that to possess its full value the pressure should be uniformly distributed over the eye. Now, there can be no

pressure so perfectly uniform as that exerted by a fluid. Suppose a man to be lying on his back, and a tube (the lower end of which is cut out so as exactly to fit the bony margins of the orbit) should be placed perpendicularly on the eye and then filled with water, there would be an equably distributed pressure on the eye equal to the weight of water in the tube. But it is not necessary that the whole tube should be of the same size as the opening at the base, as the amount of pressure at the bottom depends solely on the height of the column of water; consequently, a small tube attached to a cup-shaped reservoir will answer all the requirements.

As the area of the mouth of a tube which will fit the eye cannot be easily calculated exactly, I constructed such a tube about two and one-third inches in the longer diameter and one and two-tenths inches in the shorter, and found that when eleven inches long it held sixteen ounces of water, every inch in height representing nearly one and one-half ounces.[1] Consequently an eye with such a tube eleven inches high, filled with water applied to it as described, is subjected to an equable pressure of one pound.

So much for the theory of the apparatus, which is constructed simply on the principle of hydrostatic pressure.

It consists of a cup made of white metal or hard rubber, as light as possible, and so shaped as to fit the orbit. The figures as represented are the natural size, except No. 3, which is reduced. From the bottom of the cup extends a flexible gutta-percha tube as long as may be required, say three feet. In the end of this a glass tube six inches long is inserted, so that the height of the column of water can be seen. To the sides of the cup two inelastic straps are attached, to fasten the instrument to the head. If of leather, there should be a sliding buckle; with any other material the common buckle will answer.

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[1] The exact measurements are:

Length of opening	2.32 inches.
Width of opening	1.2 "
A column 11.111 inches high weighs	16 ounces.
A column 5.555 inches high weighs	8 "

Each inch represents 1.44 ounces.

Fig. 1 represents one form of the instrument, and Fig. 2 another. In Fig. 1 the mouth of the cup is covered with thin

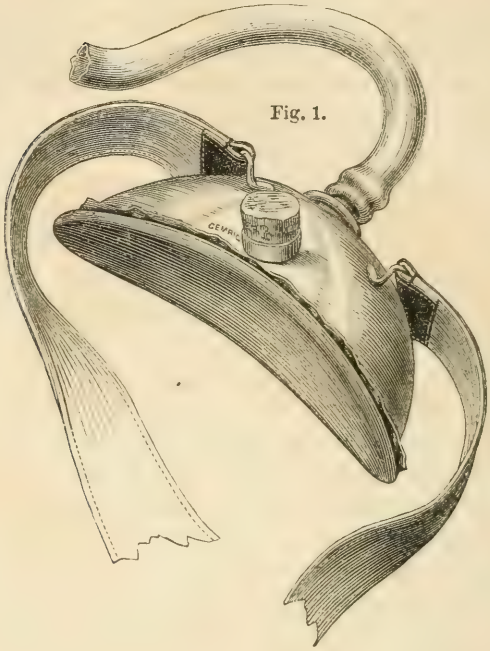

Fig. 1.

sheet india-rubber, tied securely with waxed saddler's silk; a groove in the edge of the cup prevents its slipping. The covering should not be stretched so tight as not to allow it to bulge out to conform to the shape of the eye when filled with water. An opening in the side of the cup, fitted with a cork, allows of its being filled with small pieces of ice when cold combined with pressure is desired. To fill the cup and tube it is necessary to remove the cork and lay the whole in water, and then insert the cork. The instrument is most easily used if the patient is in bed. After it is filled the cup is readily fitted to the eye, and then strapped closely to the head. The end of the tube is then fastened to the head of the bed or the wall behind it. The difference between the level of the patient's eye and the water in the glass tube will show at once the amount of pressure exercised, as each inch, as before said, rep-

resents about one and a half ounces. The length of the flexible tube allows free motion to the patient's head on the pillow. A socket in the side of the strap will allow of an upright support of cane or light wood, to which the tube may be tied, if it is desirable that the patient should not be confined to the bed.

Fig. 2 represents the instrument so arranged that direct

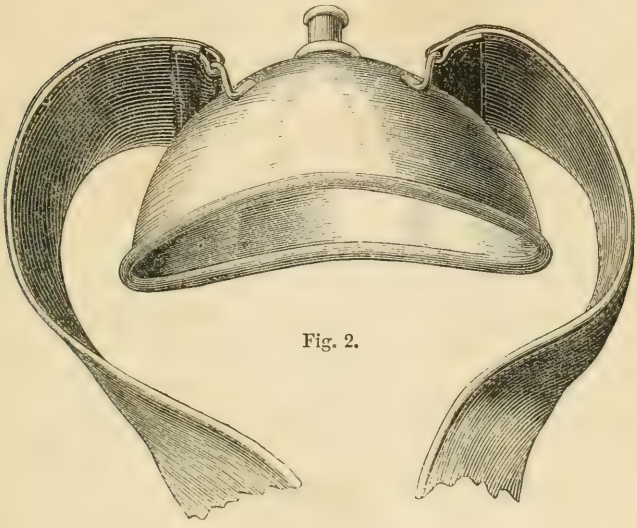

Fig. 2.

pressure may be applied to the eye without the intervention of the lids. The mouth of the cup is open and the edges guarded by soft gutta-percha, otherwise it is the same as Fig. 1. Though more difficult in application this form has this advantage: the cup can be filled with either hot or cold water, to which any drug desired may be added, and the patient, by opening the eye—which experience has proved is perfectly practicable—receives not only direct pressure on the eyeball, but the direct action of whatever medicament has been used. In using this form the end of the tube must be held on a level with the cup. The latter is then filled with the liquid, and, while the patient bends his head well forward, it is carefully fitted to the eye and securely strapped. But care must be taken that until this is accomplished the end of the tube is kept at exactly the same level as the cup. After this the tube can be fastened

above the head at whatever height may be desired (as in using Fig. 1), and the surgeon must exercise his own ingenuity in accomplishing this.

Fig. 3.

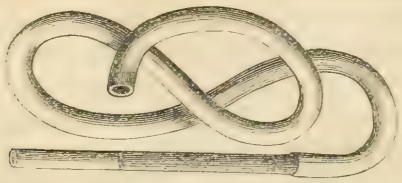

Fig. 3 simply represents the gutta-percha tube with the glass tube at the end.

A Method of Dressing Eyes after Cataract Extraction, and other Ophthalmic Operations requiring Rest by Exclusion of Light. By C. R. Agnew, M. D., of New York.

The accompanying woodcut shows the dressing as applied after the operation for extraction of cataract. The dressing

consists, first, of two strips of isinglass plaster, about two and one-half inches long by a quarter of an inch wide, applied

over the closed eyelids to keep them shut; next of a strip of soft, thin linen or cotton cloth, in the form of a parallelogram, large enough to extend laterally beyond the temporal edges of the orbital rims, upwards to clear the superciliary ridges, and downwards to a horizontal line drawn through the cheek-bones. Next a piece of black silk sufficiently large to overlap all but the upper edge of the cloth; next of some strips of isinglass plaster long enough and broad enough to attach themselves partly to the silk and partly to the contiguous skin, so as to hold the dressing in place. If the silk be so thin as to be translucent it should be made of two folds, otherwise one fold will suffice. A notch may be made in the centre of the lower edge of cloth and silk, so as to permit a close coaptation between the dressings and the skin in the angles formed by the intersection of the wings of the nostrils with the surface at the base of the upper lip.

It is claimed that this dressing, when carefully applied, is sufficiently permeable to permit the proper escape of heat and moisture, and is yet so opaque as to shut out light, and therefore to produce natural rest for the eyes, while it is free from weight, and incapable of making any other pressure than that which the natural coaptation of the eyelids and eye-ball makes.

It is a clinical desideratum to be able to treat a case of ophthalmic surgery in a well lighted room, without admitting light to the wounded organ. Such a dressing makes it easy to surround old and feeble subjects with an atmosphere chemically fitted by direct light for purposes of respiration, and thus to quicken the vital forces and lessen the dangers which spring from delayed or perverted reparative processes. It favors regular and easy care of the patient, and the performance of such offices as may pertain to his comfort or safety. It permits, at proper times, such entertainments as may tend to give pleasant occupation to the mind and banish the apprehension and dread which always exist, to a greater or less degree, in the case of those who are served in the dark by groping or stumbling attendants.

It is claimed, moreover, that this dressing does away with

the dangers arising from the use of pressure bandages, dangers much greater than some are now prepared to admit—but dangers proved to exist by the great variety of the bandages, and the attempt made to give formulæ for the measurement of the pressure made by a given bandage.

We believe that there would be fewer eyes lost by suppuration, after extraction, for example, if pressure bandages were entirely discarded from the surgical armamentarium, and eyes allowed to be shut and at rest unopened for a few days after severe operations.

It remains to be proved that pressure aids the union of wounds in the eyeball. We believe that the natural dressing of a wounded eye is the closed eyelids, and the only other local condition needed is the rest afforded by the exclusion of light by closure of eyes and repose of the facial muscles. Pressure enough from bandages to secure such desiderata is scarcely attainable, or, if obtained, becomes so soon intolerable as to provoke the surgeon to a speedy readjustment of his bandage—a readjustment often made necessary for the relief of symptoms which are found, on a candid examination, to have originated in the effects produced by accidental displacement of the bandage which, perhaps, twelve hours previously had been fastidiously applied.

This method may also be used after the abstraction of blood by Heurteloup's leech, giving the local rest afforded by darkness, and, when desirable, associated with gentle bodily exercise to keep up the play of the circulation, and thus help to discuss a choroidal or other ophthalmic congestion.

It is our common practice to apply this dressing immediately after an extraction, and not to remove it until the expiration of five days, when it can be easily detached by washing, and reapplied, if need be. A very little experience will enable a surgeon to post himself as to the progress of a case after extraction by the subjective symptoms, with the additional testimony obtained by gently passing the finger over the silk dressings to determine the question as to whether swelling of the lids exists.

Let a patient be placed after an extraction operation amid

such circumstances as will tend to increase gently and healthfully the activity of the nutritive forces; protect him against the meddlesome officiousness of a peeping pathologist, and less will be known of the small beginnings of morbid changes in wounds and fewer eyes lost. The *vis medicatrix naturæ* can nowhere play a more satisfactory part than in the healing of eye-wounds. To this end there must be a good supply of nourishing food, excluding alcohol, excepting in cases where you wish to retard the tissue-wasting of old age. There should be rest of the wounded and fellow eye insured by closure of eyelids and exclusion of light. There should be fresh air, influenced by the presence of sunlight, for the patient to breathe. There should be the cheerful presence of discreet attendants, not of persons given to restless meddling.

The dressings after an extraction or iridectomy should be allowed to remain upon the eyes until the afternoon of the fourth or fifth day, and the temptation to open the eyes met by the recollection of the fact that there is a struggle in every wound between the reparative and destructive forces, and that rest by exclusion of light and air aids the former and antagonizes the latter.

A Question in reference to Photographing the Interior of the Human Eye. By B. Joy Jeffries, of Boston, Mass.

At Dr. Algernon Coolidge's request I lately saw, in consultation at the Massachusetts General Hospital in Boston, a lad some fifteen years of age who had been kicked by a horse over the right frontal region, breaking in the outer table and involving the frontal nerve. The boy was totally blind of this, the right, eye. As atropine had been put in I could not say whether the pupil acted with the other eye, which was quite normal. I made an ophthalmoscopic examination by Jäger's strong mirror and full sunlight. The patient had no perception of light whatever, although the reflex was too strong for me to look at long. The sunlight, partly obscured by a thin white cloud, gave me the most beautiful view of the fundus oculi I ever remembered to have obtained. This was with

the upright image. The same with the reversed. The fundus looked *perfectly normal*, except a grayish tinge to about two-thirds of the papilla; as the same, however, existed in the other apparently normal eye, I could not regard it as indicative of any pathological change. A few weeks afterward both Dr. Coolidge and myself thought this grayish portion was less, or encroached upon by the encircling white outer ring of the papilla. My prognosis was that vision might return, in whole or in part, which time (some three months) has confirmed. There is a portion of the retina quite to the outside of the macula where visual impressions are transmitted through the nerve. Or, as no change can be seen by the ophthalmoscope in the retina, it may be more correct to say that some of the optic fibres now transmit impressions. The patient told me that he could begin to see a little, and, in sweeping the reflection from the ophthalmoscope over the retina, I found there was an eccentric spot so sensitive to light as to make him jerk back his head every time the light fell upon it. It was with difficulty that he could fix the chalked cross on my blackboard. He had to hunt some time to find it, and approach to about seven or eight inches. Whether there was less perception than normal through this small spot of the retina, or whether vision corresponded to its eccentric position, I could not determine. I, however, succeeded in mapping it out roughly, and it did not exceed a single square on my "Register of the Field of Vision." As the lad's other eye is perfect and he has no pain, it will of course be difficult to keep run of the case.

But that which is of special interest, and my reason for reporting this case, is, that we here had a perfectly normal fundus oculi entirely destitute of sensation to light, and with transparent media in front of it. From not being able to communicate in time with Dr. Noyes, of New York, who possesses the necessary skill and apparatus, an opportunity was lost to achieve a scientific triumph, namely, the photographing the interior of the normal human eye, which, I believe, has not yet been done. A question then arose as to whether the retina might be damaged by throwing on it an amount of light sufficient to obtain a photographic picture from its reflection, for I felt that vision might again return in this eye, and there-

Register of the Field of Vision.

B. Joy Jeffries, M.D. Boston.

Right Eye.

Left Eye.

fore any risk of injury to the retina was unjustifiable. The only direct answer to this was some experiments I had read in the Vienna Academy Reports for 1867, by Dr. Vincenz Czerny, on the objective change in the eye, especially the retina, from the effect of light. Werneck reported in Ammon's Zeitschrift für Ophthalmologie, 1834, having broken down by concentrated sunlight cataract in animals, and seen it gradually absorb. He proposed doing the same in man. Cases have now and then been reported, by E. Jäger, Arlt, Coccius and Schirmer, of injury of the eyes from exposure to sunlight, for instance, during an eclipse. As Dr. Czerny says, it is rather curious that physiologists should not have sought for objective change in the retina from the effect of intense illumination, especially as it is practically important to know what degree of intensity we may safely use in ophthalmoscopic examination. These experiments, the results of which I will briefly give, were carried out by, in general terms, concentrating sunlight with a double convex glass through the pupil. The animals operated on were the dog, cat, rabbit, guinea pig, mouse, dove, duck, goose, hen and frog. Dr Czerny obtained no result by the spectral colors, light colored by absorption, or gaslight.

In the eye of a frog (*rana temporaria*), a few minutes after throwing into the pupil sunlight with a two-inch glass, there was nothing to be seen but a slightly colored spot on the bluish gray fundus. Gradually this spot became clearer and more defined from the rest of the field. After some three hours it was sharply defined, light gray, the edge reflecting a yellowish light. The retinal vessels ran in a gentle curve over the spot, showing by evident parallactic movement that the retina under them was raised above the normal level. This and further changes, visible by the ophthalmoscope, induced Dr. Czerny to ascertain what objective change took place in the retina. The effect on the crystalline lens was to produce cataractous opaqueness. I would refer to his article for the detail of his experiments and the proofs of his results.

He says: "There is no doubt, then, that we have a coagulation of the albuminous bodies in the retina, especially in the rods, as also in the lens. Hence the white spot on the pigment-

ed fundus, the cataract, and perhaps also the greater resistance to the effect of reagents by the portions not too coagulated. This last explains the greater resistance of the frog's blinded retina, the elements of the external granular layer retaining their spindle form, also the better preservation of the rod layer in the guinea pig. Finally, I think the contraction of the retinal vessels by blinding in animals some time dead, is due to the coagulation of the albuminous substance present in the circular fibres. There can be no doubt that under these conditions the production of heat in the *tapetum nigrum* is the cause of the coagulation."

By experiments Dr. Czerny proved that it was the light-rays of the sunlight and not the dark heat-rays which produced this warmth. I refer to his paper for the proof. He goes on to say—

"The coagulation caused by intense illumination proves the production of heat on the border of the layer of rods and cones of the retina, a heat, too, sufficient to coagulate the albumen of the retina. Further experiment must determine the requisite degree of this heat."

"This being settled, we may safely conclude that in ordinary vision the rays of light produce heat in the retina, in much less degree, of course. I do not, however, consider that having proved this fact, proves also the correctness of Draper's theory of vision, namely, that it is the rods feeling the heat of the *tapetum nigrum*, but simply that the theory of this hypothesis is proved—*i. e.*, that light produces heat in the *tapetum nigrum*."

"We have, therefore, an answer to the necessary physiological postulate, a material change in the perceptive nervous elements, a change which may destroy them by very intense action of the normal irritation."

It will be seen, therefore, that the photographing such an unimpressible retina as I had in this patient might be attended with some danger to its elements. Dr. Czerny found his focus on the retina must be quite perfect to produce the effect he did. If general illumination by dispersion circles will satisfy photographic demands, then there would be no danger of causing injury to the contents of the globe. Had I at the time

possessed the necessary apparatus and skill in photography, I should not have hesitated to have attempted a photographic picture of the interior of this patient's eye.

Apparent Movement of Muscæ. By Dr. G. Hay, of Boston.

The occurrence of the same error in respect of the apparent movement of muscæ in three recent ophthalmic treatises seems worth noticing, notwithstanding that the subject-matter is of no great practical importance.

According to Wells,[1] p. 319, "The situation of the muscæ may be approximately ascertained, as was shown by Listing, by making the patient look through one of the minute apertures of the stenopaic apparatus, or a pinhole in a card. Now, if the card is moved in a certain direction (*e. g.*, upward) and the objects also move upward, they are situated behind the pupil, whereas," etc.

According to Wecker,[2] p. 287, "It results that the movements of the scotomata do not agree, in all the positions which they occupy, with those of the screen."

"If, for example, the opacities which cast a shadow are behind the pupil, they are displaced in the same direction as the orifice of the screen."

If this means that the shadows move *on the retina* in the direction stated, relatively to the portion of the retina illuminated by the rays from the aperture in the screen, or relatively to the shadow of an opacity in the pupil, it is correct; but the more obvious meaning of the passage is that the muscæ appear to the eye affected with them to move so and so.

Again, we read in Stellwag,[3] p. 645, "The scotomata themselves seem to move; but, * * * it is clear that the movements of the scotomata are not necessarily the same with those of the aperture in the screen, but that a coincidence in direction is only necessary if the entoptic bodies lie behind the pupil."

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[1] A Treatise on Diseases of the Eye. Phila., 1869.

[2] Études Ophth., Vol. ii., Paris, 1866.

[3] Treatise on the Diseases of the Eye, etc. New York, 1868.

Thus we have the same statement in these three books. Wells refers to Helmholtz, Phys. Optik, p. 150. On turning to the passage, however, we find the following :

"The entoptic field of vision is bounded by the circular shadow of the iris. If we successively look at different points of the field, the shadows of all bodies which are not in the plane of the pupil change their position in reference to the circular boundary of the field of vision. This movement of the shadows in the entoptic field of vision Listing calls the *relative entoptic parallax ;* he calls it positive, if the movement of the respective shadow has the like direction with that of the point looked at" (des visirpunktes), etc. The direction of movement of the point of fixation in the field of vision is just the opposite of that of the movement of the screen. "The relative entoptic parallax * * * is positive for objects behind the pupil," etc.

The expression, "If we successively look at different points of the field," would imply that by the "movement of the respective shadow" Helmholtz means its movement as it appears to the person affected with the muscæ or opacities, and not its real movement on the retina, relatively to the portion of the retina illuminated. If the latter were the meaning, the citation would support Wells' statement.

Fick[1] gives diagrams (p. 343) illustrative of the relations involved. In one of the diagrams the screen is represented as moved downward, the line of vision consequently upward relatively to the position of the aperture in the screen. In the explanation the following occurs: "The shadow of C" (an opacity behind the pupil) "has consequently undergone an apparent movement upward, in the same direction as the point of fixation."

Fracture of the Crystalline Lens in Persons executed by Hanging. By E. Dyer, M. D., of Philadelphia, Pa.

Three years ago I presented to the Society the result of the examination of the eyes of a man who was hanged, also some

[1] Die Med. Physik. Braunschweig 1856.

experiments on the effects of hanging on the crystalline lens of the dog.[1] In the case of the man the anterior capsule and the lens of the right eye were fractured. The direction of the fracture was horizontal and a line below the centre, extending as far back as the middle of the lens. In the left eye the anterior capsule only was involved. In one dog the same conditions were found, in another only one lens was fractured, and in a third no lesion was detected.

Since then I have experimented on rabbits. Two were hanged and four were strangulated. The trachea in two of the latter were laid bare and tied, but no fracture was detected in any case. Drs. S. W. Mitchell and W. W. Keen, who assisted me at the experiments on the dogs, were present.

The following are the notes of several executions at which I have been present since my report of the case already mentioned. I have been able to examine the eyes of the criminals both before and after death. Albert Tenfel, aet. 24, was executed at Doylestown, Penn., April 18, 1867. He attempted suicide by strychnia six hours before execution, but the physician to the prison was early apprised of it, and by emetics and other means frustrated his attempt on his life. Vision in both eyes normal at an examination the day before execution. The fall was five feet; knot under left ear; the body was suspended twenty-five minutes; easy death; very slight convulsions; neck not dislocated.

First examination, five minutes after the body was cut down. In both eyes pupil well dilated; media perfectly clear; fundus normal.

Second examination, one hour and five minutes after execution. Left eye, horizontal fracture one and one-half lines below the centre of the lens, extending entirely across it. The line of fracture is not true, as if drawn by a ruler, but irregular, as if drawn by a person with an unsteady hand. At the external end a line runs upward, beginning at the margin of the pupil; at the internal end a line runs directly downward. These look exactly alike, and could not be better described

[1] Trans. Amer. Ophth. Soc, Vol. iii., and N. Y. Med. Journal, Sept. 1866, Vol. iii., p. 416.

than by comparing them to a tear in a sheet of note paper. Right eye examined at the same time. Four very fine lines were seen running toward the centre of the lens in the lower nasal quarter. They seemed to be simply in the capsule, but were perfectly apparent. The left eye was extirpated, and on dissection the results of the ophthalmoscopic examination were fully verified; not only the capsule, but the substance of the lens was fractured.

Drs. G. R. McCoy, O. P. James, Wm. Stavely, and T. Swatzlander, physician to the prison, kindly assisted me in the examination and distinctly observed these lesions.

Gottlieb Williams, aet. 34, was executed in Philadelphia, June 4, 1867. Drop four and one-half feet; the knot slipped so as to be under the occiput; suspended thirty minutes; convulsive movements lasted five minutes; neck not dislocated.

Examination at 11.54 A. M., five minutes after the body was cut down. Appearance of eyes natural; no protrusion; no injection of conjunctival vessels; corneæ clear.

Right eye, pupil well dilated; media clear. Small point seen on the anterior capsule of the lens in the median line, just above the margin of the pupil. At 12, M., spot more distinct; at 12.26 P. M., spot still present, somewhat elongated. Optic nerve normal; retinal vessels small.

Left eye, pupil smaller than the right; cornea clear; lens in normal condition; optic nerve normal; arteries small. I was not allowed to remove the eyes.

Drs. H. Yale Smith, physician to the prison, W. W. Keen and J. Ewing Mears assisted me in the examination.

At Worcester, Mass., September 25, 1868, Silas James and Charles T. James were hanged at the same time. The drop was four feet. Silas James had a cataract in the left eye of several years' standing, probably the result of irido-choroiditis. The right eye was normal. Eyes examined thirty minutes after execution.

Right eye normal in every particular. Left eye, pupil well dilated; cataractous lens dislocated downward and outward; upper and inner third visible above the pupil. Remains of

the detached posterior synechiæ well marked.[1] The neck was dislocated; no struggle.

Charles T. James, hanged at the same time, had normal eyes. After the execution the pupils were moderately dilated. Left eye normal. Right showed small horizontal fissure in capsule of lens. Thirty minutes later this fissure was well marked and easily seen even by side-light illumination. It certainly extended into the substance of the lens. Unfortunately I was not permitted to remove the eyes from the bodies.

The physician to the prison, Dr. Rufus Woodward, and Dr. C. W. Whitcomb, of Barre, Mass., kindly assisted me in the examinations, and noticed the condition of the lenses as I have here described them. This unpleasant series of investigations has been pursued with the hope of throwing some light on the vexed question of the mechanism of the accommodation, but as yet without any satisfactory result.

[1] It is to be regretted that no attempt was made to break these by atropine before execution, but no opportunity offered.

TRANSACTIONS

OF THE

American Otological Society.

Second Annual Meeting,

Newport, R. I., July, 1869.

AMERICAN OTOLOGICAL SOCIETY.

The second annual meeting of the American Otological Society was held at the Atlantic Hotel, Newport, R. I., on Tuesday, July 20th, 1869.

The following members were present:

Dr. John H. Dix	Boston, Mass.
" J. Orne Green	" "
" D. B. St. John Roosa	New York, N. Y.
" Wm. F. Holcomb	" "
" R. F. Weir	" "
" H. D. Noyes	" "
" John Green	St. Louis, Mo.
" E. L. Holmes	Chicago, Ills.
" C. E. Rider	Rochester, N.Y.

In the absence of the President, Dr. John H. Dix was elected President, *pro tem.*

Dr. H. Knapp, of New York, was invited to take part in the scientific business of the Society.

The minutes of the last meeting were read and approved.

The following Committee of Membership was appointed by the President, viz., Drs. Holmes, Holcomb, Roosa, J. Orne Green and Rider. On recommendation of this commitee the following gentlemen were elected members, viz.:

Dr. C. J. Blake	Boston.
" H. S. Shaw	"
" H. Knapp	New York.
" H. G. Newton	Brooklyn.
" J. S. Prout	"
" W. W. Seely	Cincinnati.
" Frank Abbott	Buffalo.
" J. W. Lawton	Syracuse.

Dr. Knapp took his seat as a member of the Society.

On motion of Dr. Roosa, it was resolved that the President appoint a committee of three to present an order of business.

Drs. Weir, Roosa and J. Orne Green were appointed such committee, which was further instructed by the Society to nominate officers for the ensuing year.

The report of the Treasurer was read and accepted.

Acting on the report of the Committee on the Order of Business, the Society listened to the reading of (1) the Report on the Progress of Otology, by Dr. D. B. St. John Roosa.

REPORT ON THE PROGRESS OF OTOLOGY. By D. B. ST. JOHN ROOSA, M. D., of New York.

MR. PRESIDENT AND GENTLEMEN:

The progress in otological science during the last year, although not marked by any grand discovery, has been substantial and far from insignificant. Here and there points have been opened up in the field which promise much from future investigation, while in some other instances subjects of importance have been fully investigated.

The new era of otology—for we may be said to be in a new era—dates from the introduction of a generally practicable mode of examining the membrana tympani (Tröltsch), and from the simplification and amplification of our means of opening the Eustachian tube (Politzer). We now stand, as regards the diagnosis and treatment of diseases of the outer and middle ear, on a position as fully advanced as that of any other department. We are still, however, sadly in need of more perfect means for the differential diagnosis of affections of the middle and internal ear, and of positive ideas as to the treatment of affections of the nervous apparatus. If it be true that he who appreciates his ignorance is not far from the path of knowledge, we may hope for speedy advancement in the latter named department of otology, since we are all in accord as to the direction in which it is to be made.

In discharging the duty which by your favor has devolved upon me, I may be permitted to go back a little further than the date of our organization in noting the advances made in

our knowledge, and thus include some of the noteworthy productions in otological literature which have appeared in the past eighteen months.

THE AURICLE.—Dr. Voltolini,[1] of Breslau, contributes an interesting article on the anatomy and physiology of the auricle. The auricle is to be considered as a reflector, condenser and conductor of the waves of sound. As a reflector it may be considered as composed of two parabolas, lying concentrically to each other. The outer parabola, the fossa of the concha, throws the undulations of sound against the inner, the tragus, whence they pass into the auditory canal. Where the auricle is small the concha is deep, in order to compensate for the loss. The auricle not only reflects, but also condenses the sound. It is also a conductor. If it were simply a reflector and condenser, it would be better adapted to its purpose if composed entirely of bone. Voltolini considers the auricle as an external membrana tympani. We know that the chief function of the true membrana tympani is to facilitate the conduction of the sound-waves from the air to certain fixed bodies. The change from one medium to another of course causes these waves to lose some of their intensity. The auricle is really a membrane, although a thick one. Muscular movement of the auricle is not made by human beings, because there is such a variety of convolutions in the part, that, come which way the waves of sound will, they fall perpendicularly to the tangent of one of those irregularities, and they are therefore well taken up. The auricle must be an important part of the auditory apparatus, because it is so well developed at birth.

The idea promulgated in the anatomical text-books, that the muscles become atrophied by wearing caps in childhood, must be incorrect, for those who observe children will see that the caps do not injure the ears at all, and, as Hyrtl says, the beasts cannot voluntarily move their ears any better. But if the voluntary movement be slight, the same cannot be said of the involuntary, which is the principal movement even in animals, as Schroeder van der Kolk has shown in his essay on the func-

[1] Monatsschrift für Ohrenheilkunde, Jahrgang ii., No. 7.

tions of the medulla oblongata. The author then proceeds to prove that the action of the muscular structure is chiefly of a reflex nature, just as the true membrana tympani is placed in different degrees of tension by the tensor tympani muscle. The reflex movements of the auricle may be seen in syringing the ear. We may also observe, in very many patients, that if we hold the watch on the outermost tip of the auricle it is heard; but if we remove it but one line, its tick is no longer perceived. The auricle is the sound receiver of a hearing trumpet, of which the external auditory canal is the tube, and since the muscle is very large in proportion to the breadth and length of the tube, we can see what nonsense it is to recommend hearing trumpets that are much smaller than the auricle.

Aspergillus.—The subject of the growth of vegetable parasites or fungi in the external auditory canal may now be said to be thoroughly worked up through the labors of Wreden,[1] Schwartze,[2] J. Orne Green,[3] of Boston, Mayer, and Hassenstein and Hillyer.[4] The aspergillus flavescens, glaucus and nigricans, as well as the stamphyllium polymorphum, have been found in the auditory passage, and are known to produce an obstinate external otitis and myringitis, which of course can only be cured by killing the parasite. The instillation of solutions of tannin, bi-chloride of mercury, lead, carbolic acid and similar agents, combined with faithful removal of the fungus by the syringe and forceps, have finally destroyed the growths and relieved the symptoms. Dr. Wreden's cases, with his remarks, form a monograph, with which the Society is undoubtedly familiar. In regard to the etiology Dr. Wreden says: "All these varieties of aspergillus, according to my view, are only varieties of the ordinary mould fungus." The origin of some of Dr. Wreden's cases could be traced to the damp walls of unventilated rooms, kept shut during the long Russian winter.

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[1] Die Myringomykosis Aspergillina, St. Petersburg, 1868.

[2] Archiv für Ohrenheilkunde, B. iv., Heft ii.

[3] Boston Medical and Surgical Journal, Nov. 19, 1868.

[4] Archiv für Ohrenheilkunde, Band iv., Heft iii., p. 162.

Exostosis.—Bonnafont[1] has recorded a case of true exostosis of the external auditory canal, not the result, so far as the history shows, of suppurative inflammation in the middle ear and subsequent periostitis, as previous investigations have proven these growths to be.[2] By the use of a small rat-tail file the tumor was broken off and a permanent opening made, which relieved the impairment of hearing which the obstruction caused. Laminaria was at one time used to dilate the opening, but it caused much pain, and it was very difficult to remove.

Diffuse Inflammation of Meatus.—Dr. Weber,[3] of Berlin, advises the use of cold compresses in the diffuse variety of inflammation of the external meatus. The use of such compresses should be continued from one to three hours. His experience is quite the reverse of nearly all that has been published on this subject, cold applications being usually considered as very injurious to the ear.

Rivinian Foramen.—In a discussion in one of the medical societies of Vienna,[4] Gesellschaft der Aertze, Prof. von Patruban, Drs. Gruber and Politzer unite in affirming the existence of the Rivinian foramen, as rediscovered by Bochdalek of Prague.

Membrana Tympani.—Dr. Moritz Popper[5] has recently made some investigations in regard to the vessels of the membrana tympani, with the advantage of a more thorough method of injection than that hitherto employed.

The membrane receives blood from two sources, the vessels ramifying on the walls of the external auditory canal and the vessels in the mucous membrane of the middle ear. The vessels from the former source ramify in the outer subepidermoidal layer, those of the latter in the inner sub-epithelial layer. The middle layer of the membrane contains no vessels except on the periphery, where there is an anastomosis

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[1] Archiv für Ohrenheilkunde, B. iv., No. 4. Monatsschrift, Band ii, No. 8.
[2] New York Medical Journal, Vol. ii, p. 424.
[3] Monatsschrift für Ohrenheilkunde, Jahrgang iii., No. 1.
[4] Ibid., iii. Band, No. 1.
[5] Ibid., iii. Band, No. 5.

between the vessels of the outer and inner layer. The vessels of the outer layer form long loops, which appear in the papillæ lying along the course of the handle of the malleus, beginning almost at the lower extremity, and passing into the papillary layer of the walls of the external auditory canal.

Eustachian Tube.—The much discussed question of the constant and normal patency of the Eustachian tube is again agitated by Weber,[1] of Berlin, who, supported by the investigations of Rudinger and Mayer, claims that the canal is constantly open in the upper portion of its caliber—that is to say, in the so-called hook cartilage portion.

Dr. Rebsamen,[2] of Zurich, concludes from his observations that the opening of the cartilaginous portion during the action of swallowing does not result from the force of one muscle alone—the variously called tensor palati, abductor tubæ, or dilator veli—but that it is the result of the combined action of a number of pharyngeal muscles.

Voltolini placed himself in the pneumatic cabinet of Lowenstein of Berlin, which is essentially a chamber in which the air is compressed by means of a pump, and he found, when the first stroke of the pump was made, that his hearing was greatly diminished, as shown by the watch, although the conduction of sound through the bones of the head was not interfered with. The pressure upon the membrana tympani became so great that the experimenter felt himself almost impelled to open the ventilator, but he restrained himself and swallowed, which relieved the sensation so that he was able to hold out for some time longer. The experiment reaffirmed Toynbee's discovery that at every action of swallowing the tube is opened, and that an equalization of the air in the cavity of the tympanum with that of the atmosphere takes place. Voltolini also believes that the air is pumped through the tube into the cavity at each opening of the pharyngeal orifice, the tube being, as it were, the barrel of the pump. The experimenter goes on to show, by experiments upon himself, that the soft palate not only lifts up on the motion of swallowing, but that it also makes a rotary

[1] Monatsschrift für O., Band ii., No. vi. et seq.

[2] Ibid., Band ii., No. 2 et 3.

motion. It is this motion that pumps the air into the tube and through this into the tympanic cavity. If we observe the membrana tympani of a lizard, which is very much exposed in consequence of the absence of an auditory canal, we see, whenever the animal swallows, that the membrana tympani bulges outward, and just as quickly falls back again. On the human subject this same movement takes place, although it is so slight, in consequence of the membrane being tied down by the malleus, that it is not observed except in those cases where a new membrane has been formed after a perforation.

Dr. Rudinger[1] finds that the faucial orifice of the Eustachian tube in persons between the ages of seventy and eighty is much wider than in young subjects. The caliber of the canal is so great that the mucous surfaces do not come in contact. The fat is changed to a finely fibered connective tissue. He thinks that Jago's case of the patency of his own Eustachian tube, recorded in the British and Foreign Medico-Chirurgical Review, was perhaps due to a similar cause, that is, atrophy of the mucous membrane and muscles.

Petrosal Mastoid Canal.—Voltolini[2] describes a passage, which he calls the *petrosal mastoid canal*, leading from the skull cavity through the petrous portion of the temporal bone to the mastoid cells. It is of importance to the practitioner to know that this canal, although not usually mentioned in the text-books, forms a way by which dangerous morbid processes may pass from the middle ear to the brain and its membranes.

In the newly born child the superior semi-circular canal is, as it were, a gate or archway, under which there is a deep fossa, which runs outward, in the direction that the mastoid cells are afterward developed. This deep fossa, large enough to admit a large quill, is filled up by a consistent, gelatinous-like fold of dura mater. It does not lessen in size very rapidly after birth, for in a child one and a half years old it is still quite large. In adults this fossa has become a canal, which always exists and which is never closed. Its entrance is on

[1] Monatsschrift für Ohrenheilkunde, Band iii., No. 2.

[2] Ibid., Band ii., No. 2.

the posterior and inner surface of the pyramid on the posterior portion of the temporal bone, between the meatus auditorius internus and the entrance to the aqueductus vestibuli, and either just beneath or in the sulcus in which runs the superior petrosal sinus. It passes from here under the arch of the superior semi-circular canal, from within outward, and is lost in the mastoid cells, and on recent preparations the dura mater is generally sunken in at the entrance of the canal.

The writer then records a case where pus found its way through the petrosal mastoid canal to the brain.

Paracentesis of Membrana Tympani.—Schwartz's brochure on paracentesis of the membrana tympani—in which the final conclusion was reached that this operation was chiefly useful in acute affections, although of some service in a limited number of chronic cases—where there is a bulging outward of the membrana tympani from accumulated mucus, blood or pus, has awakened discussion on this subject. Tenotomy of the tensor tympani, exsection of the malleus, perforation by a galvano-caustic apparatus, are procedures which may be said to be on trial, but which have not as yet been fully adopted as legitimate and successful means for the relief of chronic affections of the mucous membrane and ossicula of the tympanic cavity.

James Hinton[1] publishes seven interesting cases, in which mucus had been accumulated in the cavity of the tympanum for so long a time as to bring them out of the range of acute cases, and for which he performed paracentesis, and for the most part with a very favorable result. He also states that the late Mr. Toynbee had devised a syringe for the double purpose of perforating the membrana tympani and of withdrawing the accumulated secretion.

Dr. Blake,[2] of Boston, in a report of one of Politzer's clinics, has described an eyelet of hard rubber, used by Dr. Politzer, with which to maintain a perforation of the membrana tympani. This eyelet may be obtained in this country.

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[1] Guy's Hospital Reports, 1869.

[2] Boston Medical and Surgical Journal.

Affections of the Middle Ear.—Weber,[1] of Berlin, has introduced a new instrument for the treatment of the affections classed under the heads of chronic aural catarrh. By its use, as the inventor claims, the spray of concentrated solutions is carried into whatever portion of the cavity of the tympanum that may be desired. The great advantage of the instrument is that by its use we are able to localize the effect of an injection. The usual arguments against the idea that fluids may be injected into the middle ear are met and rebutted by the author, and he well shows the fallacy of experiments made on the dead subject, in which the aid of the muscles is necessarily dispensed with.

Dr. Weber's instrument is called the *pharmaco-koniantron*. It consists essentially of a long flexible catheter, which is inserted in one of metal. The former has a lateral opening in its beak, which may be turned in any direction desired. An india-rubber air-bag, or syringe, connected by a side piece to the catheter, is the means of sending in the fluid which becomes spray. It seems to be a modification of Bishop's nebulizer.

Schwartze,[2] in two articles, in English and German respectively, calls attention to the use of strong solutions of nitrate of silver in suppuration of the middle ear, unattended by the formation of granulations or the development of necrosis. As the Society is well aware, this treatment is by no means new, and yet it has probably never before been used with such precise indications as those laid down by Dr. Schwartze. Solutions of nitrate of silver of a strength of from xx. ad xl. gr. ad ℥i. aq. destillat are poured into the ear, and are repeated daily, *pro re nata*. A solution of salt is immediately used after the instillation, in order to neutralize the silver.

Dr. Schwartze[3] relates a case of hemorrhage into the cavity of the tympanum in Bright's disease. The patient also suffered from retinal hemorrhages. The first aural symptom was pain. The membrana tympani was of a bluish-red color; on the next day it was of a dark red. The membrane became perforated

[1] Monatsschrift, Jahrgang ii., No. 4.

[2] Archiv für Ohrenheilkunde, iv. Band, i. Heft. London Medical Times and Gazette.

[3] Archiv für O., Bd. iv., No. 1.

and the blood coagulum escaped. The patient died. Post-mortem showed great hypertrophy and dilatation of the left ventricle, atrophied kidneys, retinitis apoplectica, with detachment of the retina. Right cavity of the tympanum, hemorrhagic inflammation of the mucous membrane; cavity filled with blood and pus; mucous membrane of the tube greatly injected, but the injection decreased as the pharyngeal opening was approached.

The left ear, about which the patient did not complain, on account of his very low condition during the latter days of his life, was similarly affected—*i. e.*, there was a dark red membrana tympani, the cavity of the tympanum containing blood and serum, without inflammation of the mucous membrane. Mucous membrane of the tube injected, and most at the pharyngeal orifice. The mucous membrane of the naso-pharyngeal cavity of a dark red, with numerous small echymoses.

Dr. G. M. Smith,[1] in a paper on the etiology of Bright's disease, calls attention to the aural symptoms sometimes arising in the course of this affection in the following language:

"Deafness is sometimes developed in the course of the disease. This symptom, when transient and accompanying a lethargic condition of the patient, has been properly attributed to uræmia. The same symptom, however, in conjunction with others, may be permanent, in which case I ascribe their occurrence to a peculiar lesion of the ear; a lesion peculiar in that it holds a relationship to the nephritic disorder, and is not, so to speak, of accidental origin. * * * It would seem desirable, when treating patients affected with obscure auditory diseases, to examine their urine both chemically and microscopically."

A case occurred in the practice of your committee, which was reported in a paper read before the New York Academy of Medicine, shortly to be published,[2] where the patient suffered for a long time from aural disease, suppuration of the drum membrane and pain, until finally the general symptoms of Bright's disease set in, adding to the importance of the case

[1] Transactions New York Academy of Medicine, Vol. iii., Part 2.

[2] New York Medical Journal, Vol. ix., No. 5.

reported by Schwartze and the suggestion made to us by Dr. Smith.

Dr. Lucae[1] writes on occlusion of the nasal passages from catarrhal inflammation, which, as he says, places the cavity of the tympanum in the condition of that of a person practicing Toynbee's method of inflation. A form of impaired hearing comes from this cause, which is relieved by securing a free opening of the nostrils.

Otitis Neonatorum.—Your committee may perhaps assume that every practitioner who has seen much of aural disease has met with cases the history of which plainly showed that the subject, a little child, had suffered from otitis long before this affection was diagnosticated. Voltolini's first paper on inflammation of the membranous labyrinth erroneously supposed to be cerebo-spinal meningitis, has called out many verifications of this point, and it has done a great service in putting the practitioner on his guard as to the origin of a disease which, if it does not lead to death, places the patient in a condition of burial from the world of sound. Dr. Voltolini has continued his observations on this subject in various numbers of the Monatsschrift für Ohrenheilkunde.

Wreden,[2] following in the footsteps of Von Tröltsch, has reinvestigated the subject of infantile aural catarrh, by examining a number of dead bodies of infants taken from a foundling institute. The existence of the mucous cushion in the cavity of the tympanum discovered by Tröltsch is verified, but it is found that it is absorbed in forty-eight hours after birth. Inasmuch as quite a full synopsis of Dr. Wreden's article appears in the American translation of Tröltsch,[3] no further quotations are made from this very valuable paper.

Voluntary Contraction of the Tensor Tympani Muscle.—Politzer,[4] after some remarks on the various theories as to the action of the tensor tympani, writes that he has satisfied himself that on the contraction of the muscle the handle of the

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[1] Monatsschrift für Ohrenheilkunde, Bd. iii., No. 2.

[2] Ibid., Jahrgang ii., No. 8.

[3] Diseases of the Ear, second edition, p. 408.

[4] Archiv für Ohrenheilkunde, iv. Bd., i. Heft.

malleus is pressed inward, while the head, with a part of the neck, is pushed outward, and that at the same time the whole malleus with its movable axis is drawn inward. He did not observe any relaxation of the anterior portion of the membrana tympani on making traction on the tensor, but on drawing upon the belly of the muscle a tension of all the parts of the membrane was observed. Politzer then records the case of Dr. A., who communicated to him the fact that for a year he had been annoyed by the occasional involuntary occurrence of the contraction of the tensor tympani. For two or three years the patient had suffered from a slight rumbling noise in his ears—sometimes in one, sometimes in the other—which lasted for hours, and sometimes for days, occurring especially when he was actively engaged in intellectual employments. Independent of this symptom, Dr. A. experienced in the depth of his ears a short and quick motion or muscular contraction, not dependent upon the will, which lasted for several seconds, and which returned at irregular intervals. These contractions were very rapid, and compared by the patient to the stroke of of a hammer making twenty excursions in the second. He was able to excite these contractions at any time, either in one ear or the other, but then the motions were not so quick, and after five or six seconds they could not be produced, because a sensation of fatigue in the ear occurred, which disappeared in from half a minute to a minute, when the contractions could again be produced. A noise in the ears occurred during the contractions and a sensation of deafness, which was relieved as soon as the contractions ceased.

On examining the membrana tympani during these contractions, a sudden inward motion of the lower end of the handle of the malleus was observed, and a lessening in size of the triangular light spot. During the voluntary contraction the uvula was pushed forward. This movement was involuntary, and yet that of the tensor tympani and uvula could be made independently of each other. Respiratory movements had no influence upon the contractions. The hearing distance was greatly diminished, as tested by the watch during the contractions. When the watch was placed between the teeth it sounded much louder, as did a tuning fork placed on the fore-

head. The deep tones of a flute were heard indistinctly when the contraction lasted for any time. Such a change was not observed in the high notes. Similar results in the perception of tones were obtained on the piano. The deep tones were indistinct, the middle ones somewhat heavier and higher, while in the high tones the distinctness was unaltered, but during the contraction it was about a fourth of a tone higher.

Ossicula Auditus.—Professor Henke[1] has contributed to our knowledge of the mechanism of the *ossicula auditus*. According to the views of previous investigators, the base of the stapes has a to and fro or sort of rocking motion on the fenestra ovalis, since it was believed that the ossiculum lenticulare or os orbiculare moved in the direction of the crura of the stapes. According to Henke there is a swinging motion around a horizontal axis situated in the base of the stapes. The object of such a movement is to render possible an extensive change in position of the membrana tympani, and also to reduce that of the stapes to a minimum—to one of a very undisturbing variety—so that the peculiar vibrating movements may radiate into the fluid of the labyrinth through the ossicula.

The distinguished inventor of the ophthalmoscope, Helmholtz,[2] has added to the debt due him for his scientific investigations by a contribution to our knowledge of the mechanism of the ossicula auditus, which should find a translator into our tongue, but which will not admit of a condensation suitable for this report.

Otological Congress.—The first Otological Congress ever assembled met at Dresden on September 20, 21, 22, 23 and 24, 1868. Dr. Schwartze presided, and delegates were present from Great Britain, Germany, and one from the United States. The session seems to have been an informal one, and hence no papers especially prepared for the occasion were read.

The subject of sea-bathing in aural disease was the first subject discussed. Dr. Magnus considered the fear of such bath-

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[1] Monatsschrift für O., Bd. ii., No. 6.

[2] Die Mechanik der Gehörknochelchen, Bonn, 1869.

ing on account of aural disease to be unnecessary. Schwartze, Jones, Hinton, Lucae and others, however, considered sea-bathing as very dangerous to the ears, both from the entrance of the water and the mechanical force of the waves upon the ear.

The experience of the Society will be valuable on this point. I have seen very many cases of aural inflammation directly traceable to bathing with exposed ears.

The use of bougies in the Eustachian tube was also discussed. Drs. Schwartze, Wendt and Lucae did not think that narrowing of the tube was as frequent as stated by Kramer. Schwartze would use the bougie as a diagnostic means when the repeated use of the air-bath produced no result on auscultation.

Two cases of breaking of laminaria bougies in the tube were reported. Guye, of Amsterdam, used bougies in about fifty per cent. of the cases of catarrh of the middle ear, while Schwartze and Lucae found them seldom necessary.

Anderson, of Glasgow, thought bougies were used too often on the Continent and too seldom in England. They should be used as in the urethra, either to remove stricture or to stimulate the mucous membrane.

Paracentesis of the membrana tympani was also discussed, but no new facts other than those in Schwartze's paper were presented.

Parasitic growths in the ear and the treatment of simple non-purulent catarrh of the middle ear were also discussed.

Pagenstecher's nomenclature was adopted as the basis for discussion. 1. Hypersecretion; 2. Vascular ectasia; 3. Sclerosis.

In the first named form, the use of the catheter, with air, vapor of the muriate ammonia and injections, Politzer's method, internal use of quinine, iodide of potassium and iron, rubbing the skin, treatment of the naso-pharyngeal membrane by gargles and injections, paracentesis of the membrana tympani, were the remedies spoken of.

In the second form no irritants should be used. The internal use of acids and the application of the artificial leech were advised.

In the third form the injection of irritants was advised.

Lucae had used atropine poured into the ear with benefit in some cases (gr. ij. ad 3i.), as far as diminishing tinnitus was concerned.

Obturation of the canal, as suggested by Politzer, had been practiced; but one delegate, Hinton, had seen any benefit from the procedure.

The Congress adjourned to meet at Innspruck at the forty-third meeting of the German Naturforscher und Aertze, when the following subjects will be discussed:

1. Treatment of chronic suppurative catarrh of the middle ear.

2. Diagnosis and treatment of the diseases of the aural nervous system.

3. The influence of quinine on the ear.

It will thus be seen that our organization antedates that of our brethren across the sea, although we have not entered upon our discussions until this year.

(2.) A paper by Dr. Wm. W. Morland, of Boston (read by the Secretary), on Deafness in connection with Pregnancy and the Puerperal Condition.

Deafness in Connection with Pregnancy and the Puerperal Condition. By Wm. W. Morland, M. D., of Boston.

Mrs. K., 38 years old, a stout, healthy looking woman, of strumous diathesis, although not very marked, consulted me some time since in relation to a deafness, which—with certain remissions, to be specified—had continued for thirteen years.

It first came on immediately after her first miscarriage, thirteen years since. She has since miscarried five times. On several of these occasions she flowed dangerously. The miscarriages have been at various periods, from six weeks to six months.

During her pregnancy she always hears perfectly—sometimes, indeed, *too acutely*. Immediately after miscarriage or delivery, the hearing is again almost completely lost. During menstrual periods she is more deaf than at other times. For the last four years she has grown much more deaf.

A noteworthy fact is that she had a sister affected in very much the same manner. Immediately after confinement with a child, at full term, she entirely lost her hearing. When the child was nine months old the mother died, so that no opportunity was afforded for observing whether the alternation of the presence and absence of the sense of hearing would occur, as in the patient's case. It is presumable, however, that it would have so occurred.

The ears, in this patient, are almost wholly normal. There was slight redness of the meatus observed, but nothing of consequence. The membrana tympani healthy in both ears. The bodily functions were all well performed. There was no headache.

The phenomena are interesting in themselves, and seemingly mainly dependent upon the different states of the circulation existing during the pregnant condition, at the miscarriages and at parturition. The nervous power was, of course, greatly affected by the above conditions; yet we hardly need resort to the undesirable and too often meaningless term "nervous deafness" to explain the circumstances. Anæmic deafness would, perhaps, be a more proper designation; yet the phenomena occurred several times when there had been no more than the ordinary loss of blood in labor.

Similar cases are noticed by standard authorities, although not precisely the same. The fact of the alternation mentioned, from *almost total* loss of hearing to recovery of the *full power* of the sense, is not, so far as I have been able to examine authorities, noted.

Tröltsch, it is true, refers to that "temporary deafness, which Von Scanzoni several times observed, after the application of leeches to the vagina, usually connected with a general vascular excitement and with the eruption of *urticaria* over the whole body."[1] He goes on to mention the "peculiar vacillations in the power of hearing" experienced by chlorotic and hysterical patients, and, noticing "the negative appearances" in the ears themselves, remarks upon the "singular sympathy"

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[1] Treatise on the Diseases of the Ear, etc. Translation by D. B. St. J. Roosa, M. D. Second Amer. edition, p. 499.

of the above phenomena "with the general health and the sexual functions," as justifying the appellation "nervous." Such are analogous cases with the one presented, but not identical.

Wilde, under the head of "Nervous Deafness," says: "Many deaf persons trace back the first accession of disease to grief, affliction, sudden mental emotion; to a shock, or to some great calamity. In many cases it first appears after child-birth, but it ordinarily comes on between twenty and thirty-five years of age." He notices the fact that both ears, sooner or later, become involved, but that the patient "almost always hears better on one side than the other." My own patient's left ear was the best. Toynbee, also, treating of "Nervous Deafness," says: "Patients have become totally deaf after the administration of too violent a purgative, or after an attack of diarrhœa or cholera, and after the nervous exhaustion attendant upon child-birth; in some instances of the latter, the deafness has begun with the birth of the first child and increased with each successive birth, until at last the nervous power was wholly lost."

I have not, moreover, seen reports of such phenomena occurring after miscarriage—only at the full term of pregnancy.

I have personally observed only one other case in which deafness was associated with the puerperal state. It occurred about six years ago, the deafness coming on immediately after the first confinement. Visible aural apparatus, healthy. Woman rather delicate, and occasionally has what she terms "rush of blood to the head," with flushing of the face. There is tinnitus aurium—sometimes a loud sound, as of working machinery, at others a sound as of waves on a beach. Both sounds disappear, or are unnoticed when in the crowded streets of a city, but become very annoying when she is much fatigued.

No other treatment was advised in these cases except general hygienic care, with tonics.

Dr. Dix remarked that he had observed cases where deafness occurred first at parturition and increased at each subsequent pregnancy.

Dr. Roosa and Dr. Weir had seen such cases, but the patients showed evidences of aural catarrh, and it was probable

that they were cases of aural catarrh increased by the puerperal state.

Dr. Knapp thought that there may be cases of deafness after parturition caused by anæmia, and analogous to anæmic amblyopia under like conditions.

(3.) A case of Acute Purulent Aural Catarrh, induced by the use of the Nasal Douche, was reported by Dr. Knapp.

A Case of Purulent Otitis Media caused by the Nasal Douche, and showing the Symptom of Double Hearing with both Ears. By H. Knapp, of New York.

The use of Weber's nasal douche for diseases of the naso-pharyngeal region has become pretty extensive. Only of late some observations came to my notice which show that there is a good deal of danger in this practice. Dr. D. B. St. John Roosa describes, in the Archives of Ophthalmology and Otology, I., 1, p. 259, etc., a case in which the origin of a purulent inflammation of the middle ear, of the very severest kind, could be traced to the use of the nasal douche. He adds that he saw, on two previous occasions, its employment causing considerable trouble in the ear, with rupture of the drum-head. He had seen few cases where the use of the douche could be tolerated for any length of time. Dr. S. Moos, of Heidelberg, in a note to the German translation of Dr. Roosa's paper, confirms the views of the latter author, by stating that he saw the fluid, injected into the nostril by Weber's douche, flow out of the ears in two cases of perforation of the membrana tympani. Although the application of the douche is not hurtful in such cases, they prove that water may penetrate through the tubes into the tympanic cavity. In one instance, Moos saw also a catarrhal inflammation of the middle ear arising from the employment of the douche.

The practical importance of these observations induces me to communicate to you the following case of a similar nature.

A merchant of New York, 32 years of age, was in the habit of injecting, by Weber's douche, warm water into his nose for chronic catarrh. He once took cold water, and felt, immediately after the injection, considerable pain in both ears, dis-

appearing, however, very soon. After that time he used warm water for six months without any unpleasant symptoms. Then he employed cold water again and experienced at once, in his left ear, a severe pain, which soon abated, but continued to be dull and annoying for a fortnight. Then suddenly it increased, was combined with headache, throbbing in the ear, loss of appetite, and deafness. Three days afterward an abundant purulent discharge from the left ear set in. He came to my office presenting all the symptoms of a very severe otitis media with perforation of the membrana tympani. He was under my treatment from the 6th of March until the 11th of April. Three weeks after his first presentation a great improvement had been obtained, the discharge was stopped, and the drumhead closed for four days. Then an exacerbation and a new perforation occurred. The discharge kept flowing for a fortnight, when again an improvement was obtained, and the patient left New York to complete his recovery under the care of his father, a physician in the neighborhood of Philadelphia.

Besides its origin this case was remarkable for an accompanying symptom, not much known yet, viz., *double hearing with both ears.* Tröltsch and Politzer mention its occurrence only with two lines; Moos records, in his *Klinik der Ohrenkrankheiten*, p. 319, what is known on it. He observed it twice, once in a patient suffering from acute aural catarrh, who heard simultaneously the third of each tone he was singing. The disease was very soon completely cured. The second patient suffered from impairment of hearing in consequence of chronic aural catarrh for ten years. One evening, to shorten a fit of his habitual asthma, he anesthetized himself by chloroform. On awaking, his deafness was very much worse, and he heard all sounds of the upper three octaves double. His hearing power diminished further until all musical sounds appeared to him perverse, and music in general, which he had liked passionately before, became a perfect horror to him. It is not stated in either case which ear perceived correctly the natural tone, nor whether the pseudo-tone was higher or lower in pitch.

The only well analyzed case of the few of double hearing on record is that of Prof. Von Wittich, on himself. The excellent physiologist of Königsberg observed, four weeks after

a severe acute purulent otitis, that he heard all tones of the middle octave of a piano *half a note higher* with the diseased ear than with the healthy one. His explanation is that exudation in the tympanic cavity had, by altering the pressure of the fluid in the labyrinth, changed the tuning of the terminal filaments of the auditory nerve.

When I examined the patient, whose history I have spoken of, three days after the discharge had set in, I found, in the diseased ear, the hearing power for noises very much diminished (watch of 6′ hearing distance heard from $\frac{1}{2}$″), whilst musical sounds were nearly as well perceived as in the normal state. A large tuning-fork, placed on the glabella, was heard *double*, namely, in the diseased ear more strongly and about two tones higher than in the sound ear. On trial with a piano I verified the same anomaly to exist for the middle and higher octaves, whilst it was not observed in the lower octaves. There was no distinct limit between single and double hearing. This phenomenon existed unchanged during the first week, when the perforation was well marked and the discharge abundant. Then both the sounds gradually differed less in pitch, until, three weeks later, they hardly differed by half a note. After the relapse, the double hearing still existed, but was no longer so marked as before.

The main difference between this case and that of Prof. Wittich is, *that in the latter the pseudo-tone of the diseased ear was higher, in the former it was lower*. The same disease had brought about in both cases a false tuning in Corti's organ. If we compare the latter with a stringed instrument, then the false tuning must have been caused in one case (Wittich's) by relaxing, in the other one by tightening the strings. Let us suppose, for example, that a string (or Corti's arc) which, in the normal condition, were so tuned as to perform three hundred vibrations per second, were now so much more tightened as to perform three hundred and fifty per second. If, then, a musical instrument—for instance, a tuning-fork—yielding three hundred and fifty vibrations per second, were sounded strongly enough to be perceived simultaneously by both ears, it would excite sympathetic undulations in that string (Corti's arc or fibre) of either ear which is so tuned as to

yield three hundred and fifty vibrations per second. In the healthy ear this would excite a nervous fibre which always conveyed to the brain the impression of three hundred and fifty vibrations per second; but in the diseased ear it would irritate a nervous fibre which always conveyed to the brain the impression of three hundred vibrations per second. Therefore two tones are perceived, and that of the diseased ear is the lower one.

I suppose this symptom, which, in analogy to diplopia, may best be termed *diplacusis binauricularis*, will be more frequently observed than has been the case hitherto, if our attention be turned to it. It may not only be of physiological interest, but guide our prognosis and treatment by demonstrating that, in the respective cases, the *labyrinth* is either primarily affected or participates in some other disease.

(4.) A paper was presented on Parasitic Growths in the External Auditory Meatus, by Dr. J. Orne Green.

Two Cases of Parasitic Growth (Aspergillus Glaucus) in the External Auditory Meatus. By J. Orne Green, M.D., of Boston.

The two specimens here shown are parasitic growths removed from the external auditory meatus. The case of the patient from whom the first was taken was reported in full in the Boston Medical and Surgical Journal of Nov. 19, 1868. The parasite had caused a marked increase in the subjective symptoms, and the deafness depending on a chronic simple inflammation of the tympanum; neither the history nor the examination revealed any previous suppuration.

The second case has never been published, and offers some points of interest, as I was myself the subject of the disease. Several times during my life I have suffered from furuncles in the meatus, the last time nearly two years before this trouble. I was treating the first case during the months of June and July, 1868, and was at the time perfect in health and ears.

In August I felt some ill defined irritation in the ears, attended by a slight serous discharge, just enough to be felt with the fingers; this, however, soon ceased without any treatment,

and was only recalled to mind on a return of the trouble in the next November, when I noticed in both ears the same slight serous discharge, with prickling, itching and occasional slight pain and feeling of fullness in the ears. The hearing was found by the watch to be somewhat impaired. Dr. E. H. Clarke, who kindly examined them, reported that each meatus showed patches of deep congestion and small white masses, which were pronounced from their appearance epidermis. A mild astringent instillation and syringing was used for a few days, when, not obtaining relief, I examined microscopically some of the small white flakes, which in gross appearance resembled epidermis, and found the parasite. An instillation of acid carbolic, gtt. v. ad ʒij., was then substituted, and the ears syringed daily for a week; but each syringing continued to bring away flakes of the parasite, and I changed to a solution of carbonate of soda, without, however, checking the growth. Every day small flakes would be syringed out, and the microscope showed that they contained great numbers of the fructifying heads of the aspergillus in early stages of development. A solution of calcaria hypochlorosa, gr. ij. ad ʒj., was then used, as recommended by Wreden, and the daily syringing continued. The sporangia became gradually less numerous, of a smaller size and earlier stage of development, and the epidermal cells mixed with them increased in number. After some six weeks of treatment the syringe ceased to bring away any thing, and the ears became normal in feeling and function, and have so remained.

It would be presumptuous to draw any general conclusions in regard to treatment from these two cases; but in my own case I am inclined to ascribe much more to the continued syringing than to the medicaments used. After their use the changes in the mycelium and sporangium described by Wreden certainly were not apparent, so that the only effect they could have had was to loosen the masses from the meatus, and the force of the syringe seems much more likely to have done this.

The subjective effect of the instillations was various: the carbolic acid solution was irritating, producing a feeling of warmth in the ear which in a few minutes increased to smart-

ing, burning and vertigo, which lasted for some ten minutes after the ear was dried. The effect of the carbonate of soda was not specially noted, but was indifferent. The hypochlorite of lime was very pleasant, seeming to soothe the irritation without producing any disagreeable symptoms; and if, as Wreden claims, it acts more powerfully than any other agent on the parasite, its mildness is an additional indication for its use.

The symptoms in my own case, showing themselves so soon after I had treated the first and only case I have seen, would seem to show that I had in some way transferred some of the spores, and that these subsequently developed; but how this was done I am unable to say. That they were transferred by the otoscope was impossible, for the end used by myself is of a different color from that used by the patient, and I am always very particular to preserve the distinction; but the spores having once obtained a resting place in one ear they could easily have been transferred to the other by this instrument, as I use it indifferently in the two ears. What particular condition favored their development after lodging in the meatus cannot be determined. I was not aware previously that the ears varied from the normal condition.

In the first case the parasitic growth had formed a thin, dark colored membrane, which covered the deeper parts of the meatus and membrana tympani, and after removal showed a perfect cast of these parts. The microscope showed a vast number of the sporangia of the aspergillus, of large size and of a slight yellow color, mixed with the stalks of the mycelium, which formed the body of the membrane. In my own case the growth had not reached such a degree of development; the pieces removed were all small, none larger than one-third of an inch square, all but one or two of a white color, and the sporangia not more than one-fourth the size of those in the first case. Nothing like a cast of any part of the meatus was discovered.

Wreden's articles are no doubt familiar to most of the members of the Society. The first appeared in the Archiv für Ohrenheilkunde, Vol. iii., and a synopsis of this is given in the Boston Medical and Surgical Journal above referred to. In the second, which appeared some months after in a pamphlet

form (Die Myringomykosis Aspergillina und ihre Bedeutung für das Gehörorgan), additional cases with remarks and experiments are given.

Wreden experimented by placing portions of the growth in solutions of medicaments considered destructive to parasites, and found, from eighteen different solutions, that those having the most destructive action on the aspergillus were the liquor calcis chloratæ and a solution of chlorinated lime (chemically pure), two grains to the ounce. From these experiments he concludes that the solutions of the subchlorides are the most destructive, and particularly recommends the chlorinated lime of the above strength, on account of its energetic action on the parasite and the slight irritation it produces in the meatus. The only caution he gives is to dissolve the salt fresh at each application, in order to obtain the benefit of the chemical action which is immediately set up, and by which chlorine and oxygen are set free, and the latter in *statu nascenti* (ozone) possesses the greatest oxidizing, *i. e.*, destructive property.

The portions of aspergillus submitted to the action of such a solution for six hours Wreden describes as converted into a homogeneous, amorphous mass, in which no sign of mycelium, sporangium or sporule was to be discovered.

The following addition to the By-Laws was made:

"An Executive Committee of three (3) shall be appointed by the Chair at each annual meeting, to nominate officers of the Society and the other committees, and to present an order of business."

Section 2 of the By-Laws was so amended that the officers of the Society shall consist of a Vice-President, in addition to the other officers mentioned.

On motion of Dr. John Green it was

Resolved, 1. That the By-Laws be so far suspended as to give to the Publishing Committee discretion to publish the Transactions of the present year in connection with the Transactions of the American Ophthalmological Society.

2. That all papers referred to the Publishing Committee be furnished to the Committee before September 1st.

3. That proofs be sent to the authors, and that they be returnable within one week of the date of their receipt; if not returned within

that time the paper may be left out, at the discretion of the Publishing Committee.

A tax of one dollar was assessed on each member.

The following subject was chosen for discussion next year, viz., Simple Chronic Inflammation of the Tympanum.

The following committees were appointed and officers elected for the ensuing year, viz.:

COMMITTEE ON PUBLICATION:

Dr. C. E. HACKLEY.
" R. F. WEIR.

COMMITTEE ON PROGRESS OF OTOLOGY:

Dr. J. ORNE GREEN.

OFFICERS FOR 1869-70:

President.....Dr. H. D. NOYES.
Vice-President..... " E. L. HOLMES.
Rec. Secretary and Treas..... " C. E. RIDER.
Cor. Secretary..... " H. L. SHAW.

The Society then adjourned to meet at the Atlantic Hotel, Newport, R. I., on Wednesday, July 22d, 1870.

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OF THE

American Ophthalmological Society.

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Total 7

Whole Number 55

AMERICAN

Ophthalmological Society.

NEWPORT, *July* 21*st*, 1870.

The Society met at the Ocean House at 10½ A. M., the President, Dr. H. W. WILLIAMS, in the chair. Members present were:

Dr.	AGNEW	New York.
"	ALLIN	"
"	DELAFIELD, F	"
"	GREEN	St. Louis.
"	JEFFRIES	Boston.
"	HAY	"
"	KNAPP	New York.
"	LORING	"
"	NOYES	"
"	ROBERTSON	Albany.
"	ROOSA	New York.
"	POOLEY	"

The Secretary read the minutes of the last day of the last session, which were approved.

The following members tendered resignations, which were accepted:

Dr.	W. HUNT	Philadelphia.
"	J. H. HILDRETH	Chicago.
"	H. B. SANDS	New York.

The following committees were appointed:

A Business Committee, to make up a bulletin, to fix place of next meeting and select the topic of discussion, consisting of Drs. Roosa, Robertson, Jeffries. Also a committee on mem-

bership, to report the names of members to be elected and of officers for the next year, and on questions of ethics, consisting of Drs. Agnew, Hay, F. Delafield, Loring, Green.

The report of the Treasurer was read and approved.

The Committee on Membership reported the names of the following persons:

Dr. Henry C. Eno - - - -	New York.
" Wm. F. Thompson - - - -	Philadelphia.
" Wm. F. Norris - - - -	"
" Joseph Aub - - - - -	Cincinnati.
" H. G. Miller - - - -	Providence.
" Robert Willard - - - -	Boston.
" Edward Curtis - - - -	New York.
" Samuel J. Jones - - - -	Chicago.

All of whom were duly balloted for and elected.

The Business Committee reported the bulletin as follows:

First. Report on the progress of ophthalmology, by Dr. B. J. Jeffries.

After reading the report and its consignment to the Committee on Publication, a vote of thanks was tendered to Dr. Jeffries for the faithful and elaborate manner in which he had performed his duty.

Second paper was on cyst of the iris, by Dr. Allin. Dr. Knapp related the subsequent history of the case which he reported last year, that the eye remained well, while the other eye had been affected by a new sympathetic form of choroiditis, from which she had again recovered. He was requested to put these statements in writing and hand them to the Publishing Committee.

Third. Supposed glioma retinæ, presented by Dr. Allin, the case having been observed by Dr. E. Mason, of New York. Remarks on diagnosis of glioma, by Drs. Knapp, Agnew and others. This and the preceding paper referred to Committee.

Fourth. Gliosarcoma, by Dr. Jeffries.

Fifth. Glioma retinæ, by Dr. Knapp; to be written out, and, with the preceding, to be referred to the Committee.

Sixth. Tumors of the retina, by Dr. F. Delafield. Referred to Publishing Committee.

Seventh. Case of diphtheritic conjunctivitis, in which canthoplasty was done by Dr. Allin.

Remarks on canthoplasty, by Drs. Noyes, Agnew and others.

Adjourned at 2½ P. M. to meet at 8 P. M.

EVENING SESSION.

Society met at 8 P. M., the President in the chair. Minutes of the morning session read and approved.

The bulletin was taken up at the

Eighth paper. Phlyctenular conjunctivitis relieved by use of prismatic glasses, by Dr. Althof; read by Dr. Allin. Referred to Publishing Committee.

Ninth. A peculiar case of conjunctivitis and keratitis, by Dr. Roosa. Referred.

Tenth. Cases of foreign bodies in the vitreous, with specimen, by Dr. Noyes.

Eleventh. Foreign body in the eye, by Dr. Pooley. Papers referred.

Dr. Williams related a case where a foreign body—a splinter of iron—had for fifteen years remained in the eye, producing no trouble until the end of that period, and also continuing unchanged in character.

Dr. Allin knew of a case where for twenty years a foreign body lodged in the lens, and caused no mischief until the end of that time.

Twelfth. Treatment of strabismus through the accommodation. Dr. John Green.

Thirteenth. Case of advancement of the rectus inferior, by Dr. Agnew. Papers referred.

Fourteenth. A point in the physiology of the circulation of the retina, by Dr. Loring.

A general discussion arose, in which Drs. Knapp, Green, and others took part. The views advanced were illustrated by an apparatus.

Fifteenth. Three cases of herpes zoster frontalis, by Dr. Jeffries. Papers referred.

Adjourned.

JULY 22, 1870.

Society met at $9\frac{3}{4}$ A. M., President in the chair. Minutes of last evening's session read and approved.

The order of the bulletin resumed.

Sixteenth. Results of thirteen Passavant's operations, by Dr. Jeffries. Dr. Noyes reported one patient who had twice been operated upon, and described the method of operating.

Seventeenth. An additional test for the degree of ametropia, by Dr. Thompson, with exhibition of the instruments.

Remarks by Drs. Loring, Green, Knapp and others.

Papers referred to Publishing Committee.

Eighteenth. Exhibition of ophthalmoscopic drawings, by Dr. Knapp.

Nineteenth. Apparent form of inverted ophthalmoscopic image in astigmatism, by Dr. Hay.

Twentieth. Neuro-retinitis. Dr. Knapp.

Remarks by Drs. Loring and Delafield relative to the continuity of the intervaginal space of the optic nerve sheath, and the arachnoid cavity. Dr. Loring quoted a case from Mauthner.

Twenty-first. A case of blepharoplastic surgery, by Dr. Agnew.

Twenty-second. A case of exophthalmos, ectropium, etc., with operation, by Dr. Noyes.

Both the last papers, accompanied by photographs, and with preceding, referred to Publishing Committee.

Twenty-third. Quinine as a local remedy in certain forms of conjunctival and corneal disease, by Dr. J. S. Prout. Read by Dr. Agnew, and referred to Publishing Committee.

Twenty-fourth. Apparent accommodation in a lensless eye, by Dr. Loring. Case to be written and then referred.

Twenty-fifth. Some curious reflex nervous symptoms resulting from traumatic lesion of the eye, by Dr. Robertson. Read by title and referred.

Twenty-sixth. Some practical points concerning cataract operations, by Dr. Knapp. On this topic a general discussion ensued on each of the steps of the operation and after-treatment.

The Secretary moved the adoption of the same resolutions

passed last year relating to the time when papers must be delivered to the Publishing Committee, and about sending proofs. Carried.

The Business Committee made the report, 1st, that the question for discussion at the next meeting be, The methods of determining ametropia. 2d. That the place of meeting be the Ocean House, Newport, at 9 A. M., Thursday, July 22, 1871.

The Committee on Membership, etc., reported that they had nominated the same officers to serve for the ensuing year, who are now appointed.

The reports of these committees were accepted and adopted. The officers were balloted for and elected, as follows:

President, H. W. WILLIAMS, M. D., Boston.

Vice-President, C. R. AGNEW, M. D., New York.

Recording Secretary and Treasurer, H. D. NOYES, M. D., New York.

Corresponding Secretary, H. ALTHOF, M. D., New York.

Publishing Committee, E. J. LORING, M. D., New York; D. B. ST. JOHN ROOSA, M. D., New York.

At 2½ P. M., on motion, adjourned.

HENRY D. NOYES,
Recording Secretary.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY. By B. JOY JEFFRIES, Boston.

Your committee have thought that perhaps the most useful plan would be to give a sketch of ophthalmic literature for the past year. This field has, however, been ably occupied by our Secretary, Dr. Noyes, in the February number of the N. Y. Medical Journal, up to that date. Our report may therefore be considered as a supplement to his, since nothing he has sketched is mentioned here. We may thus more readily inform those of the profession outside of our specialty what is going on among us, and perhaps save some time to those of us who are too busy to keep as thoroughly conversant with others' results as they could wish, and as the ever advancing science of ophthalmology demands.

Herpes Zoster Frontalis. An Inaugural Dissertation by Rudolf Jacksch. *Breslau, pp.* 40, 1870.

Dr. Jacksch reports a case observed by him in the clinique of Prof. H. Cohn, and gives a summary table of 50 recorded cases, with historical and literary notes and deductions. It is interesting to see how Hutchinson and Bowman's notices of this very curious affection have caused it to be observed and carefully recorded already in various parts of the world. Your committee will report three more cases at this meeting of the society, observed by himself and Dr. G. Hay.

A Treatise on Diseases of the Eye. J. Soelberg Wells, 1869. *Philadelphia.*

Mr. Wells' book has already been some time before the profession, both in and outside of our specialty. It has been repeatedly reviewed and discussed by those familiar and unfamiliar with ophthalmology, and we have never known of any work on the eye written in English that has received such general, and, we hold, such well merited commendation. It is *the* book we always advise a student or practitioner to possess, because it is truthful, scientific, practical and concise. The author very properly avoided the absurdity of attempting to write a handbook on diseases of the eye within the compass of a few hundred octavo pages, as such are of no use to the student, and still less to the practitioner. Mr. Wells' volume our ophthalmic brethren are already acquainted with. We step for a moment out of our proper sphere, perhaps, in especially recommending it to the profession at large, and we trust to see it in the U. S. Army and Navy supply list in place of any other. We only wish an American ophthalmic surgeon had written it. The English imprint, on good paper, bound in this country, now sells for $4 currency. For what it contains we know of no cheaper medical publication.

Ophthalmoskopischen Hand Atlas. Von Eduard Von Jaeger. *Wien,* 1869.

We have here one hundred and twenty-eight chromo-lithographic pictures of the interior of the eye as seen through the ophthalmoscope, whose author states, "in all these there is not a single stroke that is in any way only a *sketch* of the

original. As minutely as my eye could see it and my hand reproduce it, I have pictured each physiological and pathological appearance, each separate retinal and choroidal vessel down to the finest, every exudation, extravasation and individual group of pigment, both as to size, form, color, position and relative bearing." To do this cost Prof. Jäger sometimes 40 to 50 sittings of from two to three hours each, upon a single picture. As a result, we have the most natural, accurate and beautifully finished collection of ophthalmoscopic pictures ever produced. Hence no matter how diagnosis, prognosis or treatment may change, these portraits of disease will remain as a classic monument to the industry, patience and perseverance of Prof. Jäger. His previous published ophthalmoscopic portraits on a larger scale showed what he could accomplish, and they are to be continued by enlarging those in this series not included among them. These colored plates are more beautiful and lifelike than the minutely accurate ones he published in his "Einstellungen des dioptrischen Apparates im menschlichen Auge." It must be remembered that he was at first no draughtsman, and regretted having issued the rough sketches in his "Staar und Staaroperationen."

This later series is accompanied with a clinical history of each case, making some 236 pages of text. Ophthalmic surgeons may be well proud of such an advance in the literature and study of their specialty. There are some reasons why Jäger has not been appreciated as he should be. His style of writing is most unfortunately involved, and his lectures difficult to follow and keep the thread of. Moreover, what he has said and done has not been quite fairly treated by the other German ophthalmic schools, which naturally give the tone to English and French sentiment. We would say here most unreservedly, that to study ophthalmoscopy with, Jäger's plates are unsurpassed by any others. Those who cannot appreciate them have not seen what is to be seen in the human eye during disease. Prof. Jäger has been most shamefully abused by his plates being stolen, distorted, one disease copied and published for another, et cetera, and all this never more so than in an article on the ophthalmoscope which appeared in the Transactions of the American Medical Associa-

tion, to which a *prize had absolutely been awarded by the committee.* Well may Prof. Jäger close his preface with the following paragraph :

" Finally I must request those who are inclined or accustomed to copy or reprint the work of others, appropriating their property, in order to obtain illustrations for their own writings without trouble, from lack of material or ability, or as some publishers, in order to simply make money, or when they, against my expressed wish (as has occurred) use my drawings as original, I request that they will have them placed in hands sufficiently skilled and truthful, in order that my pictures may not be absolutely mutilated and appear but caricatures of nature."

A Treatise on Intra-ocular Tumors, from Original Clinical Observations and Anatomical Investigations. H. KNAPP, M. D. *Translated by* S. COLE, M. D., 1869.

This work appeared before 1869 in the original, and has been so frequently mentioned by the journals that we here refrain from other than a brief quotation from our own notice of this American translation. As Dr. Knapp says, " the ties which indissolubly bind ophthalmology to general medicine and surgery, can scarcely be better demonstrated than by the history of tumors encountered in and about the eye." Hence the interest felt by the general surgeon in the results of careful study of the tumors within the globe or arising from it, and this all the more since on close inspection they are found to be rather limited in variety, notwithstanding the long lists heretofore devoted to ocular tumors. The author says : " Were I to rely on my own observations, ocular tumors would hardly admit of more than two varieties, viz.: *glioma*, originating in the *retina;* and *sarcoma*, proceeding from the *choroid*, and being in part *unpigmented* and in part *melanotic.* When of long duration, especially in recidives after extirpation and in metastasis, *glioma* may become sarcomatous and perhaps carcinomatous, and primary *sarcoma* may also become carcinomatous."

The main body of the book is made up of the description of glioma and sarcoma. He first gives the report of his cases, and then the general description, including diagnosis, prog-

nosis and treatment. In an appendix he gives notes on other forms of tumor occurring in the eyeball, such as sarcoma of the iris, myo-sarcoma, tubercle, syphilitic tumors, lipoma, cysts, simple melanoma, granuloma, &c.

I cannot refrain from adding something, in explanation as it were, of what such a work as this of Dr. Knapp means. It is the first and only thing in English of the kind. It tells us clearly and precisely what glioma and sarcoma are, and how and where they originate in the eyeball. We learn some definite rules for diagnosis, prognosis and treatment of these malignant or semi-malignant diseases; and, by the method the author has taken of arranging his work, we can at once take hold of the practical part when requiring hasty reference and speedy decision. Up to the time of its appearance in German we had almost Virchow alone to fall back upon, and in ophthalmology of course lacked special reference to those cases in which we needed assistance.

In the *Royal London Ophthalmic Hospital Reports* cases of "cancer of the eyeball" had been reported by Hulke, Hutchinson, Cowell and others; these I had studied, and agree with Dr. Knapp when he says: "Most examples of intra-ocular cancer which are mentioned in medical literature, particularly in English, I could comprise without trouble under glioma and sarcoma, and whenever I was not successful, the description was so deficient that *no other* explanation could be given."

Following the appearance of Dr. Knapp's book in German, there appeared in Græfe's *Archives of Ophthalmology* the anatomical report of eight cases of glioma of the retina by Dr. J. Hirschberg, which he observed in Græfe's clinic in Berlin. Dr. Leber reported a fine specimen of "Cavernous Sarcoma of the Choroid." Also our report further on will be found to make frequent mention of articles on intra-ocular tumors and their microscopical investigation. But what is of more importance, Prof. Græfe, who had not previously so fully concurred in Dr. Knapp's views, published a summary of his extensive experience on tumors within the eyeball. What this experience was, will be best understood when I say that Græfe had in the course of the year one hundred and fifty (150) cases of intra-ocular tumors, two-thirds ($\frac{2}{3}$) of which

were choroidal sarcoma and one-third ($\frac{1}{3}$) retinal glioma. More than a hundred of these eyes were extirpated by Græfe, and their anatomical examination was made by Virchow, Recklinghausen, Klebs, Cohnheim, Leber and Hirschberg. Through the physicians who sent him many of the cases, his own clinical observations, and the researches of the above mentioned distinguished anatomists, he was able to draw up his conclusions, which, finally, are more nearly the same as Dr. Knapp arrived at than I should have been disposed to believe, since all observations must necessarily differ, had I not carefully studied them in comparison with those of our author.

But still I hear some iconoclast saying to such studies and such books, *cui bono*. You must not expect us to interest ourselves in, or know about, pathology. I answer simply, the ophthalmoscope shows us a commencing glioma in the retina, clinical knowledge and experience with the instrument tell us how to diagnosticate the intra-ocular growth from others, and say to us do not delay a moment in enucleating the eyeball; the microscope then confirms our diagnosis, and so far experience tells us the patient's life is saved when the glioma has not gone up through the optic nerve. A parent tells you his infant's pupil sometimes glistens like the cat's. Do not then let the old idea of cancer and death prevent your advising immediate examination or induce your advising against instant enucleation, since life may thereby be saved.

Recent Advances in the Theory of Vision. H. Helmholz, *pp.* 83.

This has been admirably translated from the German into French by Dr. Javal for the "Revue des Cours Scientifiques." His translation appeared also in the "Annales d'Oculistique" for 1869, the first three numbers. The "Gionale d'Oftalmologia Italiano" has in 1869 published it in Italian. It would seem as if Helmholz's name was quite sufficient to have insured its appearance in English before this time. It was our intention to have translated this article of Prof. Helmholz as a substitute for this scanty sketch of ophthalmic progress, but conference with the publishing committee assured me the society would not print the manuscript. We are indebted to Dr. Javal

for a copy of the article in the original, and for his interest in our proposed translation, which probably would have been reviewed before publishing by Prof. Helmholz himself.

Nothing but a complete reproduction could do justice to such an article as this on the theory of vision. It takes up all the results of experience and experimentation in the physiology of vision, and compares and adjusts them. We have thus a clear insight of where recent knowledge is directing present theory. After a *resumé* of our knowledge of the anatomical conditions of vision, Prof. Helmholz analyzes experimentation and deduces clearly his theory of vision. That such are of importance to us ophthalmic surgeons seems proved by the fact that two journals of our specialty publish the article in full in different languages. It is also of sufficient interest to the physicist to call for an English translation.

Upon the Termination of the Nerve Fibres in the Retina of Men and Animals. Max Schultze. *Archiv für Mikro. Anatomie, Band. V.*, 1869–70.

This is one of a series of papers on the anatomy of the retina which Schultze has published in his journal. They are, of course, of special interest to ophthalmologists, and although the author's results can hardly be given without illustrations, we will endeavor to briefly explain them here. He has found a new system of fibres in the retina hitherto unnoticed. By comparison with various kinds of animals he concludes these fibres to be the terminal distribution of the optic nerve. By high magnifying powers (1000 to 1500) the membrana limitans is seen composed of a series of fine shining points, from which spring delicate, short fibres, of equal length, like ciliæ. These fibres are crowded around the bases of the rods and cones, appearing on the surface of the *limitans externa* as dotted circles. On the base of the cones there are some 40 dots, on the rods 8 to 10 or 12. The centre of these circles, corresponding to the body of the rod or cone, is free of this dotting. The inner portions of the cones exhibit on their surface delicate linear markings. These lines touch the fine fibres coming from the above mentioned dots (holes) of the *limitans externa*. On the finest cones of the *macula lutea* and *fovea centralis* this linear marking could not be detected. With × 1000 to × 1500 and

good preservation, a parallel linear marking was also seen on the surface of the inner member of the rods. Schultze has not yet determined whether these fibres, which pass through the *limitans* and to the surface of rods and cones, also pass to the *external* member of the cones. He found on *rods* that had lost the outer member 8 to 12 fine fibres projecting beyond the inner member.

In reference to the connection of the fine fibres with the external granular layer, Schultze thinks that his former discovery of the formation of the rods by 8 to 12, and the cones by a still larger number of primitive fibres, shows that these newly discovered fibres running on the rods and cones are a subdivision of the rod and cone fibres. Thus we have an analogy between the outer layers of the retina and those epithelia of the organs of sense in which non-nervous epithelial cells interchange with nerve fibres.

The Macula Lutea of Man and the Ora Serrata of Some of the Vertebrates. Dr. Fr. Merkel. *Leipzig*, 1870, *pp.* 20, *with plates in* 4*to.*

Dr. Merkel's observations so nearly touch Schultze's that we give them here for comparison. He thinks Schultze's newly discovered fibres to be what W. Krause describes as "needles." Merkel found in the external fibrous and granular layer, that the connective tissue separating the nervous fibres of the cones formed tubes, in which the former took their course. Sections of these in the *limitans externa* make dark points, which he thinks are Schultze's points of passage of the cone fibres. These points he says, however, are connected with the supporting apparatus, and not with the termination of the nerves. In the outer layers of the macula the connective tissue forms a peculiar closed system of tubes, in which run the nervous undivided fibres that connect with cone and cone granule. Thus in taking a general view of the macula, we find as respects the nerve structure, that the fine optic fibres pass each into a ganglion cell, from which passes out a prolongation dividing into two fibres of equal thickness; these fibres each pass into a granule of the external granular layer; here they become twice as thick, and perhaps pass directly into a cone fibre.

The connective tissue system is equally simple. In the inner granular layer there is a pretty close network thickly studded

with cells and granules; from here pass inwards undivided fibres forming a network of finer fibres with their ends terminating at the limitans interna. The fibres passing outwards become the fibrous covers of the cones ending in the limitans externa. Cell-like structure of the connective or supporting apparatus is found only in the inner granular layer.

The infinite difficulties surrounding such microscopic studies as those of Schultze and Merkel readily explain discrepancies. But we watch with eager interest the gradual development of the anatomical structure of the retina by histologists, for by their side stand a number of physiologists, waiting for facts to support one or another theory of vision. And the ophthalmic surgeon and pathologist must depend on the researches of both to guide his study and his practice.

Ophthalmological Physics and their Practical Application for Physicians and Students. Dr. Hugo Gerold, *Parts* 1 *and* 2. *Vienna*, 1869–70, *pp.* 660.

The title of this book explains what its purpose and object is. We may, however, be allowed to quote from Dr. Gerold's preface the following: "The invention of ophthalmoscopy and its results were the immediate cause of oculists studying more carefully the foundations on which it was based, built up from the present thoroughly worked up physical materials." "Physics as the advancing light, clears up by its laws the so often obscure connection of symptoms; by mathematics it makes clear the mechanical principles of the visual organ, and in consequence not seldom also its anomalies;" "hence ophthalmic writings have during this new period assumed, so to speak, a physico-mathemetical character."

Dr. Gerold then explains what we all recognize as the trouble, namely, that the ophthalmic surgeon has to go too far in the field of optics and mathematics to find what he needs for his daily work, and is readily repulsed, particularly if he "in physicis et mathematicis nicht mehr so au fait ist."

This is a difficulty to be met in the cause of science, to overcome which is the effort of this work. Therefore it contains: 1st. The laws of optics, so far as absolutely necessary for the ophthalmic surgeon. 2d. The principal points in the dioptric investigations according to C. Newmann, with special refer-

ence to the human eye. 3d. The present knowledge of the mechanism of accommodation, and as applicable to practical ophthalmology, the locality and nomenclature of the "*principal points*" in the range of vision. Naturally following this is the study of the use of glasses, developed step by step.

We recognize the whole as an advance in this field of study, and earnestly recommend all familiar with German to read or at least refer to it.

A Theory of Light; or, How we See and What we See. H. F. Goblet. *London, pp.* 310.

This extremely interesting book of Mr. Goblet is really a contribution to the physiology of vision, now occupying the studies of so many distinguished observers in our specialty, as well as exclusive physiologists. It would be difficult and occupy too much space here to give in detail what there is of new in this treatise. We cannot forbear, however, from quoting a paragraph or two which show the general character of the work. Mr. Goblet says: "As bearing on this question," What is color? "we may recur to the affection of the eye known as color-blindness." "It is stated that certain persons are naturally insensible to certain hues. Color is seen, but not under the same designation that we affix; red may be mistaken for blue, and so on with other hues. Now what is that element or constituent in red, which may thus escape detection? Why should the special action of the rays whence results the sensation of red, ever be absent; and why, and under what circumstances, can red possibly produce the idea of blue? From the philosophical researches of Sir J. Herschel, directed to the question of color-blindness, we learn that the source of error is not, as might be supposed, in the mechanism of the eye, but it is the result of an incapacity of the sensorium to distinguish the character of some particular hue. A red ray, for instance, is duly transmitted, but the sensorium is unable to appreciate it, and reports some other hue. Could we determine exactly under what circumstances the error arises, we should be a step nearer to the discovery of that which constitutes color."

"It so happens that the writer is in a position to speak with certainty as to the possibility of the existence of *degrees* of power to distinguish given hues. For a long period of time

he was engaged in a series of experiments connected with this work, and having the expressions and relations of color for their object; and during the course of these experiments he was led to remark the occasional intervention of an uncertainty of results for which he could not account, or suppose any sufficient reason." "It is needless to detail the steps taken; but they ended in a very unexpected result. The writer became for the first time alive to the fact that the fault was in his own vision. The two eyes had not precisely the same power of perception; or, rather, to speak correctly, the sensorium was not affected exactly in the same way, under the sensations of color conveyed by the two eyes severally. The amount of difference was extremely slight, and might never have been detected but for the accident that the writer had been engaged in weighing, with the utmost possible accuracy, the impressions afforded by color. The nature of the difference was, that one eye saw any given series of hues *on a colder scale* than the other; very slightly less, yet still distinctly so. The conclusion, therefore, was that the sensorium, as connected with the left eye, was not so sensitive to the family of red rays as it was in its connection with the right eye; and further experiment soon proved this to be the case. The disturbing influence of which the writer was in search, was now readily traced. Unconsciously, the sensations conveyed through the left eye had at times been preferentially acted on; while at other times the right eye had been the accepted channel. Hence a strict agreement between the conclusions reached was not always possible."

"The existence of an inequality of impression on the sensorium, and of an occasional preferential use of one eye over the other, has been referred to by Sir J. Herschel, who arrived at the same conclusion by other means. The habit of alternating the action of the eyes would seem to offer some analogy with the process of changing the weight of the body from one leg to the other, giving the nervous energy the benefit of an intermittent rest. But the existence of an inequality of sensitiveness does not seem necessarily confined to the mere perception of external form—it may possibly extend to questions of color more frequently than we ourselves suspect. The possibility is

worth keeping in view where questions of extreme delicacy of tint are in dispute."

Lectures on the Accommodation and Refraction of the Eye. By Dr. Edouard Meyer. *Paris,* 1869, *pp.* 270. *Edited by* Dr. A. L. Roulet.

Dr. Meyer says in his preface that a complete course on ophthalmology would require not less than three terms as long as the one in which he gives two lectures a week at the "Ecole Pratique de la Faculté de Médicine." The course of Prof. Gavanet on medical physics gives his students that portion which Meyer leaves out, and which he says so swells the writings of Helmholz, Donders and Græfe with figures, physics and mathematics as to frighten off the majority of physicians. Therefore Meyer lectures on the practical part of the subject, namely, the refraction and accommodation of the eye and their anomalies. Dr. Meyer says he follows Donders' book exactly, both in the method and practice. These published lectures, therefore, are good, clear, simple and truthful—a sketch, as it were, of Prof. Donders' work.

Determination of the Optical Condition of the Eye by the Ophthalmoscope, with a new Modification of the Instrument for the Purpose. By Dr. Ed. G. Loring. *Extracted from the Am. Jour. Med. Sciences, April,* 1870.

Dr. Loring has in this paper shown the very practical use of the beautiful form of ophthalmoscope exhibited by him at the last meeting of this society. We regret with Dr. Loring that Mauthner's text-book on ophthalmoscopy, which includes this important branch of determining the optical condition of the eye, has not yet been translated into English, so as to be available for all. However, this excellent practical article of Dr. Loring's will supply its place for the present. His method of use must naturally be adopted by all ophthalmic surgeons, as the results are truthful, accurate, and alike save time and annoyance for the patient and physician. The ophthalmoscope and its adjuncts we may well be proud of as of American manufacture, and congratulate ourselves that so original an inventor and practical worker is of our specialty. To be able to make a rapid ophthalmoscopic examination without fatigue to the patient, and at the same time select the glass he may require

within a number or two, or determine the meridian and approximately the amount of astigmatism present, is something for which we must thank our confrère.

Experimental Researches on the Errors of Form and Accommodation of the Human Eye, pp. 25. Dr. A. Schumann, *Leipsic.*

There is something new and important in this pamphlet which we cannot pass over. Dr. Schumann says in a note on p. 8, in reference to eliminating the accommodation by atropine before testing refraction: "It will be asked why I did not apply atropine to my eyes. By heresay I know of some cases where atropine caused acute glaucoma. As I have but one sharp eye, and none to replace it should this be lost by glaucoma, I think I must omit using atropine."

The last paragraph in the pamphlet is, however, the following: "Finally I may be allowed to say that I am convinced that hereafter choroidal hyperæmia will not be treated in the usual antiphlogistic manner, but by rest, atropine and most carefully chosen glasses. I believe the time is coming when the majority of mankind will wear glasses, because the majority do not have truly emmetropic eyes. To prove this will be the effort of a later work, for which my present material seems insufficient.

The Theory of Ocular Defects and of Spectacles. Dr. H. Scheffler, *Translated from the German by* R. B. Carter. *London, pp.* 240.

All of us know the difficulty of rendering into clear English such a book as this of Scheffler's. There are some in our specialty who are not sufficiently acquainted with German to read a treatise of the character of this in the original, or rather they feel there is too much work to go through with it except in an English garb. They will therefore gladly welcome the translation. Moreover others out of the strict limits of ophthalmology are likely to study Scheffler's book, in order to satisfy their curiosity as to "what all this means about the eye in German." Hence it is we frankly admit regretting the time necessarily taken by Dr. Carter in this particular translation. Scheffler's is one of the few books in German which we are *not* glad to see thrown open to the profession at large unfamiliar with the modern languages. We cannot but

consider it will increase that national idiopathic dread of all German science, as being theoretical and unsatisfactory. Let every one read this volume who is sufficiently interested, but we would impress on those not familiar with Donders and Helmholz's writings, that these latter are in a very different style, stamped with the impress of practical knowledge. To those in our specialty we need hardly say any thing. We feel convinced they will not abandon present nomenclature, present standard views and methods of application, for those of the author. We cannot agree with Dr. Carter that Scheffler has cleared points not foreseen or arranged for by Donders. It is true that Scheffler has given us quite a different view of the anomalies of refraction and accommodation—another standpoint, so to speak. But his deductions are eminently unpractical, and governed also by theories based upon by no means proved facts. Scheffler's "Physiologische Optik," his supplement to it, "Die Gesetze des raümlichen Sehens," and this work on "Ocular Defects" by no means represent the German school of physiology or ophthalmology. They may be classed as ingenious experimentation, building up original theories that are too quickly made and too confidently argued from. Scheffler's works are simply provoking. He is, moreover, not content to theorize from his own observations, but builds on other's work as well; for instance, his chapter on the "Microscopic Examination of the Retina," from Max Schultze. Theorizing may do no harm, but it also can do no good when it is allowed to run away with facts. This volume of "Ocular Defects" almost defies criticism, except in another book as large as itself. We repeat that we wish Dr. Carter's time had been spent on some other work.

Failure of Sight from Railway and other Injuries of the Spine and Head, its Nature and Treatment. T. W. Jones. *London*, 1869.

We may regard this treatise of Mr Jones as the ophthalmic surgeon's supplement to Mr. Erichsen's "Railway and other Injuries of the Nervous System." The appendix on inflammation we of course do not speak of here, or Mr. Jones' differences with Virchow and Cohnheim. The rest of the book has a good deal practical if not new in it, and will give us all hints in reference to testimony as experts in suits for damages by

railway or other injuries. Mr. Jones sets before us cases of spinal injuries in which amaurotic failure of sight supervened, and discusses the subjective and objective symptoms, connecting the amaurosis with symptoms through the nervous chain, and giving his explanation of the disturbance of the circulation and movements of the pupil. The same is followed out for injuries of the brain, and we finally have his views on the diagnosis, prognosis and treatment of amaurotic failure of sight from railway and other injuries of the spine and head. Although a pretty large book is made out of the subject as handled, and rather a positive tone pervades it, we cannot but regard it as a valuable contribution, well worth reading and owning. As the book seems to have an eye somewhat to possible suits for damages by railway accidents, we cannot but remark that the report of Mr. Erichsen's cases quoted, and those of the author, could not withstand the cross-examination of any attorney. The book will call the attention of ophthalmic surgeons to methods of ascertaining the truth in reference to a *plaintiff's* vision, since in the cases given the patients' assertions are taken as true. Its publication will do good, although a sharp lawyer may from it learn hints how to baffle experts, in order to make justice lean to the side on which he is employed.

Sympathetic Troubles of Sight. Dr. A. Mooren. *Berlin*, 1869, *pp.* 169.

The truthful record by a careful observer of all cases of sympathetic ophthalmia occurring among over forty thousand patients with diseases of the eye, is given us in this monograph of Dr. Mooren. We may take at once, then, the facts deduced, some of which are the following. The proportionate number of times affections of the several parts caused sympathetic trouble are :

Conjunctiva	1	Iris	10
Retina	4	Choroid	14
Sclerotic	4	Ciliary Body	26
Cornea	8	Atrophy of Globe	18

A deduction from his fourth chapter is that "every inflammation involving the uveal tract, no matter from what cause originating, may produce sympathetic trouble, when it takes the character of cyclitis from the commencement, or assumes it during the course of the disease."

He finds that sympathetic irido-cyclitis leads almost universally to atrophy of the globe and total amaurosis. In fifty-two cases he found it originating from the following causes in the eye first affected :

Wounds of the sclerotic involving the ciliary body	14
Atrophy of the globe with probable wound of the ciliary body	9
Reclination of cataract	7
Inflamed staphyloma	4
Detachment of retina with irido-cyclitis	4
Atrophy of the globe not traumatic, preceded or accompanied by irido-cyclitis	4
Simple irido-cyclitis	3
Irido-choroiditis not traumatic	2
Iritis aggravated by iridectomy	2
Hernia of the iris not traumatic	1
Choroiditis ectatica	1
Phthisis bulbi following cataract operation	1
	52

Mooren does not rely on Græfe's proposed section of the ciliary nerves, and considers that " enucleation of the eye first affected must remain the principal method of treatment." In the thirty months preceding, 55 enucleations performed as preventive operations were perfectly successful. During the same time 32 enucleations were performed after sympathetic trouble had shown itself; with excellent result when the sympathetic affection was in the form of *secretion neurosis*, with much less when there was a material lesion, and four times without effect.

Dr. Mooren's monograph shows us more strongly than ever the advantages to be gained by early enucleation, and points out most clearly when we shall be too late to do good by this operation. In the majority of his cases he did not use an anæsthetic.

Sympathetic Affections of the Eye. Dr. L. Laquer. *Paris*, 1869, *pp.* 56.

The author has arrived at such similar results as Mooren, that we need only introduce here his deductions as follows. The results of enucleation as a method of treatment are :

1st. Enucleation is a sure means of preventing sympathetic accidents.

2d. It always cures sympathetic troubles of a nervous character.

3d. Its effect is satisfactory in sympathetic irido-keratitis.

4th. It generally stops the progress of serous irido-cyclitis.

5th. It is rarely successful in plastic irido-cyclitis.

Dr. Laquer, as Mooren, gives only opinions in reference to Græfe's proposed section of the ciliary nerves.

Secondary or Symptomatic Retinitis. Dr. A. Bousseau ; *with four chromo-lithographs. Paris*, 1869, *pp.* 134.

Dr. Bousseau in this thesis divides :

Sympathetic Retinitis.

- 1st. General affections.
  - Albuminuria,
  - Syphilis,
  - Leucoma,
  - Tubercle,
  - Diabetes mellitus,
  - Oxaluria,
  - Alcoholism,
  - Poisoning by tobacco,
  - " sulphuret of carbon, etc.
- 2d. Lesion of the cerebrum or orbit.
  - Optic neuritis,
  - Neuro-retinitis.
- 3d. Ocular lesion.
  - Non-inflammatory affections of the choroid,
  - Vitreous and retina.

To this last class he adds pigmentary retinitis. He makes a distinction between congenital *retinitis pigmentosa* and pigmentary retinitis, and gives the following differential diagnosis of the two forms:

RETINITIS PIGMENTOSA.	PIGMENTARY RETINITIS.
1st. It is congenital and often accompanied by various anomalies. Both eyes are affected at the same time.	1st. Occurring accidentally at any age. May attack but one eye alone.
2d. Troubled vision (hemeralopia nyctalopia) and contraction of the visual field nearly constant.	2d. May present the same phenomena, but exceptionally.
3d. Pigment disposed in a zone around the papilla and macula.	3d. Pigment irregularly disposed, more often around the papilla and the region of the macula.
4th. Absence of choroidal and other lesions.	4th. Always choroidal trouble. Often iritis and keratitis.
5th. Slow but steady onward march to total blindness.	5th. Much more rapid progress. When once established, remaining stationary.

This monograph is interesting and the subject well digested by the author, whose bibliography is very valuable. We wish

we could give the same praise to the "quatre bèlles planches en chromo-lithographie" accompanying the pamphlet. A lecturer could not teach or a student learn by these.

Traité des Operations qui se Pratiquent sur l'Oeil. Drs. Meyer *et* Montmaja.

This work we must at present judge of from the first three *livraisons*, containing 136 pages of text and twelve photographs from life. This is not the place to criticise it or speak of omissions or commissions. Such a work is very valuable to surgeons out of the reach of communication with their confrères, who desire or are forced to operate on the eye, and yet have had no opportunity of witnessing or practicing ophthalmic surgery. The text and wood-cuts give a full description of the common operations, and the good-sized photographs show exactly how the several steps are carried out. This is a new plan, and although expensive, yet is almost the only true method. We cannot but think that a little study of the best text-books, for instance Wecker or Wells, with watching ophthalmic operations or following an operative course, would place a practitioner or student in better position to feel at home with any operation on the eye, than this treatise of Drs. Meyer and Montmaja, excellently got up as it is.

Isolated Ruptures of the Choroid. Dr. C. Caillet. *Strasbourg*, 1869, *pp.* 64

This is a thesis written for a medical degree. It is very well put together and has a good chromo-lithograph and a wood-cut, the former giving the ophthalmoscopic picture, and the latter the field of vision in a case of rupture of the choroid. Dr. Caillet collects twenty-one cases, but does not count those of Dr. Knapp published in the Archives for Ophthalmology and Otology, vol. 1, 1869, numbering eight. Neither list includes all of the other observer's, and so the two papers, Dr. Knapp's and this thesis, must go together. A report of a majority of the cases recorded are therefore to be found in German, French and English together.

Some Rare Ocular Tumors. Drs. J. Hirschberg *and* L. Happe, *pp.* 14.

1. *Glioma retinæ endophytum.*—In a young infant. No neoplastic growth in the uveal tract; it evidently started from the

pars ciliaris and the neighborhood of the retina, and was microscopically undoubted glioma.

2. *Sarcoma of the choroid and secondary tubercles in the retina and sclero-corneal region.*—Choroidal sarcoma occurred in a child twelve years old. The growth was free of pigment. The *secondary* tubercles in the retina came with *primary* choroidal tumor. Three interesting points.

Royal London Ophthalmic Hospital Reports, Vol. 6, *Parts* 3 *and* 4.

These two numbers contain, besides the usual interesting reports of miscellaneous cases, Mr. Taylor's observations upon an "Improved method of extracting in cases of cataract," for which we are not ready to desert Græfe's peripheric linear operation. Dr. Noyes' (of New York) modified operation for closed pupil after removal of cataract. A very interesting paper by Mr. R. P. Oglesby on the recovery of sight after atrophy of the optic disks. An account of some pathological specimens recently added to the hospital museum by the curator, Mr. J. B. Vernon. Miscellaneous cases, by Mr. George Cowell. Color blindness caused by neuritis, by Dr. J. J. Chisholm. Results of wounds of the eye, and three cases of optic neuritis, Mr. J. W. Hülke. A second and third series of cases of herpes zoster frontalis seu ophthalmicus, by Mr. J. Hutchinson, bringing his numbers up to 41; also two cases of the same by J. B. Scriven and F. M. Mackensie, quoted from the "Indian Medical Gazette."

We mention these papers to call attention to them, and also to the fact becoming more apparent each year, that the staff of our eye infirmaries in the United States should follow the good example set by their English brethren, and not let pass, without use in this manner, the rich material constantly coming before them. We look upon such reports as valuable to instruct students, to inform the profession of what is taking place in ophthalmology, and to interest that portion of the community from whom the funds for carrying on these public charities are derived.

The Ophthalmological Society Meeting at Heidelberg, 1869.

Drs. Hering and Meyer both reported interesting cases of luxation of the crystalline lens.

Dr. Oscar Liebreich reported his results with chloral hydrate, too well known now for us to need dwell upon them.

Dr. Berlin read a paper on the effect of strong convex glasses on eccentric vision, which we can but refer to, as it requires diagrams.

Dr. Hippel reported his further results in investigating the nerves governing the secretion of the eye. He says: 1st. Intra-ocular pressure is quite independent of the general blood pressure. 2d. The trigeminus certainly has fibres which possess the power of actively dilating the vessels. 3d. Probably the trigeminus is the nerve governing the filtration or secretion of the eye.

Dr. Adamiuk followed in a paper on intra-ocular pressure, which led to considerable discussion, participated in by many members present, in reference to its bearing on glaucoma and iridectomy.

Dr. L. Wecker exhibited a demonstrating ophthalmoscope, following the plan of Laurence's "ghost ophthalmoscope." By this instrument the seemingly paradoxical idea is realized, of examining the fundus of an eye in all its details without the observer's looking into it.

Dr. Schirmer read on the condition of accommodation at various heights of the visual plane. He finds: 1st. The range of accommodation lies nearer the eyes with depressed than with raised visual plane. 2d. The increase of the range of accommodation at the near point end, with depressed visual plane, in the observed cases of myopia, was decidedly less than the loss at the far point end. 3d. The range of accommodation may vary with the elevation of the visual plane, being largest when the latter is depressed. 4th. The increase of accommodation with varying height of the visual field is quite different in different persons.

Dr. Woinow, on the structure of the crystalline lens. He holds the bipolar arrangement of the lens fibres in the rodents is simply mechanical. And now further says that the lens protuberance (Linsenhügel) noticed at certain stages of development of the lens in the class just mentioned, is also seen, but not so characteristically marked in animals having the tripolar arrangement of the fibres. The bipolar and tripolar lenses

are not distinguishable in the early stages of development. Dr. Woinow's paper is to be found in the Report of the Vienna Academy of Science for July, 1869, No. 17.

Prof. Förster exhibted, by request, an instrument he calls a perimeter, for examining the field of vision by a hollow sphere. A figure would be required to explain it here.

Prof. Förster reports also in himself an interesting case of *amaurosis partialis fugax.*

Dr. Nagel reported very favorably on the use of quinine collyria in chronic catarrhal conjunctivitis; also with phlyctenular pustular forms, and especially in one case of purulent infiltration of the cornea after extraction of cataract.

Prof. Græfe telegraphed from Berlin to the society a short communication on iridotomy in doubtful iridocyclitis, speaking very highly of it in a given case where iridectomy efforts had failed.

Dr. Leber read a paper on troubles of color perception in amblyopia, which, with the discussion it gave rise to, we can only here refer to.

Dr. Liebreich, of Paris, read a paper on the course of the nerve fibres on the papilla and retina, by which he would explain many pathological and physiological appearances. He referred, in explanation, to some of the plates now published in the second edition of his atlas.

Dr. Iwanoff read a paper on conjunctivitis and keratitis phlyctenularis. His conclusions from microscopic examinations were: 1st. The process is quite superficial, close beneath the epithelium; this latter, at any rate at first, not participating in the formation of the phlyctenula. The subepithelial tissue also at first exhibits so little change that we cannot consider it the source of new cell formation. The *cells forming the eruptive papule arise from somewhere outside of the place they later collect at.* This is specially evident in the cornea, in which tissue they are somewhere formed, and to reach the surface they choose the way already taken by the nerve twigs going to the epithelium. 2d. The road these cells take in the cornea, and their final collection at the spot where the nerves end in the epithelium, explain to us the severe photophobia always accompanying this process. It is evident that only the first

development of these papules is associated with pain, as when fully formed the great mass of cells together press the fine nerve fibre, and either destroy it or prevent sensation in it. 3d. Our present knowledge of the normal structure of the cornea is too limited for us to deduce any thing definite in reference to this process.

Dr. Iwanoff contributed a paper on *choroiditis disseminata*. He makes four forms, not, however, always distinctly typical, but occurring with varying combinations. The first form is that already described by Fœrster as *choroiditis areolaris*. The second form, glandiform excrescences of the elastic lamina of the choroid press forward in the outer retinal layers to the middle granular layer. Seen on the surface, these growths have a yellowish white color, surrounded by a circle of collected pigment. The retinal layers appeared destroyed only to the summit of the growth. Here and there the supporting fibres of the immediate neighborhood had completely closed in the choroidal growth, so as to separate it from the general choroidal tissue. Occasionally these products reached into the innermost layers of the retina, and their origin was only determined by the analagous relations of the neighborhood. It may be conceived that the process can run on without inflammatory symptoms, and produce no other disturbance of vision than monocular scotoma corresponding to these growths. The third form: M. Schultze and Babuchin have taught that the pigment epithelium belongs to the retina, and not to the choroid. This third form of choroiditis disseminata consists in the growth of this epithelial layer, and is therefore clearly to be separated from the first two forms. Strictly speaking, it is rather a retinitis. The pathological process consists in a local excessive growth of this pigment epithelium, which presses in conical masses even into the internal granular layer. The new-formed cells are always pigmentless. The retinal elements are quite destroyed. The pigment molecules are pushed aside by the growing mass. The fourth form commences in the external layers of the retina, but is already known from Dr. Pope's researches. The growth affects not so much the external granules as rather the outer end of the radial fibres, which lengthen excessively, and, by looping over, fasten on to the loosened

pigment epithelium, and thus transport it into the retinal tissue.

Dr. Reuss gave the chief points of his article on *astigmatism after cataract extraction*, published in the "Ophthalmometric Studies," Vienna, 1869.

The degree of the anomaly of course depended on the time elapsed after the operation. It was also dependent on the method of operating. Flap extraction exhibited much greater astigmatism than modified linear; vision for distance was bettered in all but one case by cylindrical glasses, and for the near in the majority of cases.

Dr. Javal read a paper on *binocular vision*. This was not reported, as the author intended publishing it in the "Revue des Cours Scientifiques."

Dr. Woinow reported his results from *ophthalmometric measurement of the lens*. He says accommodation must be completely paralyzed by atropine before we can speak of "accommodation for distance." He found the posterior surface of the lens much more curved in accommodation than hitherto reported. As to change of position, it is too small and variable to be definitely determined. Dr. Woinow also spoke on the angle alpha of Helmholz, or the angle made by the visual line and the axis of the cornea.

Dr. Mauthner made a communication on the same angle alpha. Both of these require diagrams to be understood. Woinow's appears in the work mentioned above, namely, "Ophthalmometrische Studien, von Reuss and Woinow," Wien, 1869.

Tubercle of the Iris. Italian Journal of Ophthalmology, 1869–70.

A very interesting case is reported by Dr. Gradenigo, of the Civil Hospital at Venice, who says: "So far as I know, no one has yet described any similar one, and much less demonstrated by the microscope the existence of tubercle in the iris." That most exact observer, Wecker, in the second edition of his very valuable work published the past year, remarks that the "tubercular diathesis does not tend to localize itself in the iris."

An iron-worker, æt. 21, entered the hospital and died of miliary tubercle, which was found in the lungs, liver, spleen,

mesentery glands, and under the mucous membrane of the intestine. The trouble in the eyes had existed some three months previously. On entering the hospital, the condition of the right eye was as follows: "Lids flabby, conjunctiva slightly œdematous, injection round the cornea rosy red, shining, deep; cornea transparent, except three or four points of some minute interstitial deposit, circular, isolated, the size of the head of a fine needle, of grayish-white color, located beneath Bowman's elastic layer, and others deeper, reaching to the anterior chamber down to Descemet's elastic membrane. The anterior chamber is reduced, the aqueous a little turbid. By lateral illumination the blue iris appears velvety, and altered in structure. Six or seven little corpuscles, quite distinct, round, the size of half a millet seed, and of a yellowish-white or slightly reddish color, jut out from the stroma of the iris into the anterior chamber, occupying mostly the external and lower segment between the greater and lesser circle of the iris. The pupil is contracted and misshapen by several posterior synechiæ; the anterior capsule mostly clouded. The globe is not tense, and no pain in it or in the course of the trigeminal branches; lachrymation diminished, the patient complaining only of frequent photopsia and an uncomfortable sensation of heat and burning in the upper lid. Vision in this eye corresponds to the opacity of the media, reading Giraud-Teulon's No. 20 at one foot distance."

Omitting all details of the case, we give Dr. Gradenigo's account of the post mortem appearances of the globes after hardening in Müller's fluid. "Size and shape normal. The cornea of the right eye was thickened to twice that of the left, the latter being healthy. Adherent to its internal surface, and projecting into the anterior chamber, were seen several nodules, rather soft, of a whitish, cheesy substance, readily separated from Descemet's membrane. The anterior chamber rather reduced. The iris adherent to the capsule of the lens at several points, thickened and discolored. Numerous yellowish-white corpuscles, similar to those in the cornea, were scattered in its parenchyma, especially on its anterior surface, near the pupillary margin, and also on the periphery. The sclerotic, lens, choroid and retina apparently normal. The vitreous

slightly turbid, and rather more consistent than usual. Near the optic nerve entrance, projecting into the choroid, were noticed two or three isolated granulations, of whitish color, very similar to the products above mentioned.

In the left eye nothing abnormal was noticed, except some of the little tumors on the iris, identical with those in the right eye. The microscopic examination of many of these nodules, taken from both eyes, revealed a histological structure having all the characteristics of tubercular formations. Dr. Richetti's report of some of these nodules, *taken from the iris*, is : " The yellowish miliary nodule, pressed between the slides and placed under the microscope, was found to be composed solely of a mass of cells ; some of them on the edge of the preparation were isolated. The larger number were perfectly round, with fine outline, the contents feebly granular, having one or more nuclei, bright and defined. Some of the cells, however, in the centre of the uniformly granular contents, exhibited a single nucleus, very large and quite round, with a nucleolus in its centre. Some of these cells were partly destroyed, others perfectly preserved ; the broken ones appeared corroded at their margin, the granular contents escaping. These cells were the size of blood corpuscles, some rather larger. Some had a lengthened, pointed form, lanceolate, resembling epithelium cells, but the contents were always the same. The characteristics of tuberculous formation could not be more marked than in this specimen."

Dr. Gradenigo concludes : " If, therefore, deduction can be made from a single case, we may conclude : 1st. That the iris, like the cornea and choroid, may be the primitive seat of tubercular material. 2d. That such a form of disease may be diagnosticated in the living eye, even when in other organs we have no certain signs of tubercular diathesis. 3d. That here, as in tubercle of the choroid and cornea, death occurs from general acute tuberculosis."

In the succeeding number of the Italian Journal, Dr. G. Arcoleo, of Palermo, calls Dr. Gradenigo's attention to the fact that he had, in 1862, in a monograph entitled " Sulla Tubercolosi Oculare," spoken of having seen tubercle in the iris, macroscopically, although not microscopically.

We would here refer to Dr. Fränkel's article on tubercle of the choroid and miliary tubercle of children, in Virchow's Archiv, Band 39, p. 49.

Ciliary Neurotomy. Prof. Secondi reports a successful case. He also reports his experience and results with reference to the

Cure of Conical Cornea, with the following conclusions:

1st. Iridodesis and iridoenclesis, simple or double, must be considered as perfectly identical operations, both in their physical and organic effects, as well as in the accidental sequelæ.

2d. Although in a large number of cases these operations, however indicated, may be harmless to the future integrity of the globe, yet they must be considered as a source of permanent danger, from accidental cicatricial attachments; and hence give rise to most severe and dangerous sequelæ, such as acute or chronic serous choroiditis (consecutive glaucoma), irido-choroiditis (progressive atrophy of the globe), suppurative irido-choroiditis (panopthalmitis).

3d. In double conical cornea these operations have proved as ineffectual in modifying the functional condition of the eye as the conicity of the cornea.

4th. Therefore, in the present condition of the science, we must have resource to the method of cure proposed by Græfe, which, if carried out with proper caution, will afford results as surprising as successful.

"*Acute spasm of accommodation and nervous spasmodic contraction on the same side of the face.*" A curious case is reported by Dr. F. Gosetti.

"*The causes of injuries to sight, and their prevention, in the present condition of society.*" A lecture by Dr. G. Calderini at the ophthalmic course of the University of Turin.

Besides the above, the Italian journal contains a number of interesting reports of injuries, and the results of present treatment in various ophthalmic cases, with reviews of books and journals in the specialty.

Annales d'Oculistique, 1869–70, *to May and June.*

Prof. Helmholz's article on the "Recent Progress in the Theory of Vision" appeared in the first three numbers for 1869, translated very perfectly by Dr. Javal. We have al-

ready spoken of this more at length. It was also translated into the Italian ophthalmic journal, but has not yet appeared in English.

Beside the reviews of books and gleanings of other ophthalmic journals, which are always good in the Annales, there have appeared in its pages a number of original articles which we must make special mention of.

Dr. Laquer, of Paris, published *a clinical study of glaucoma.* He found the relative frequency of glaucoma in women compared with men to be as 3 to 2, which corresponds with Donders and Arlt's observations. It attains its maximum between the ages of 50 and 60 years in each sex. In reference to the refractive state of the eyes affected, he finds : 1st. The majority of glaucomatous eyes are hypermetropic. 2d. Glaucoma is very rare in very myopic eyes. M. above $\frac{1}{4}$ seems to exclude glaucoma. 3d. Hypermetropia cannot be considered as a predisposing cause of glaucoma, but it accompanies it. 4th. It generally precedes the other glaucomatous signs. 5th. And is probably due to flattening of the cornea. 6th. In certain cases iridectomy may cause it to disappear.

In reference to the frequency of the different forms of glaucoma he says : 1st. Glaucoma simplex appears in more than a quarter of all the cases. 2d. Glaucoma acute and subacute together do not embrace the fourth of all cases. 3d. The chronic forms in the inflammatory outbursts constitute half the cases. 4th. Acute glaucoma is ten times more frequent with women than men. 5th. In subacute glaucoma the number of women is three times that of the men. 6th. Finally, that the number of women diminishes in our tables as we approach the forms of glaucoma in which inflammation is rare, and in true simple glaucoma this number is below that of men in the ratio of 4 to 7.

Under the heading of irregular forms of glaucoma he mentions : 1st. Myopia developed acutely. 2d. Glaucomatous retinitis. 3d. Hæmorrhagic glaucoma. As to bilateral frequency, in 234 cases he had 73 occurring in but one eye, and 161 in both eyes.

Some new instruments are spoken of in the Annales which, as we have not yet used, we refrain from more than mention-

ing. A new artificial leech, by Robert & Collin ; a binocular measure for strabismus, by the same. Also an artificial eye for ophthalmoscopic study, by Dr. M. Perrin, and a new optometer, with an essay, for diagnosticating and measuring all *errors of refraction of the eye*, by Drs. Perrin and Mascart.

Dr. Laquer, of Paris, also contributes an article on the "*Sudden Changes of the Refraction of the Eye*," from which the following conclusions are taken : 1st. A diminution of the refraction sometimes appears with diphtheritic paralysis of accommodation. 2d. It occurs probably also in a part of the simple paralyses of accommodation not complicated by mydriasis. 3d. Refraction diminishes in exophthalmos caused by rapidly developed orbital tumors. 4th. Refraction increases with subacute attacks of glaucoma. 5th. It increases sometimes suddenly in convalescence from severe diseases. 6th. Many myopes reduce it by partly shutting the eyes.

Dr. Talko reports a case of *operation for separated retina*, by which the vision was increased from nothing up to $\frac{1}{8}$. Three weeks afterward, however, the separation was as before operation.

A memoir presented to the Academy of Sciences is published by Dr. Giraud-Teulon on the *effect of positive and negative glasses, and their distance from the eye, on the size of the ophthalmoscopic image of the optic papilla in anomalies of refraction, especially in astigmatism.* This is a mathematical and optical discussion from which practical rules in reference to the application of glasses in emmetropia and ametropia are deduced. The author's name is sufficient to stamp its importance.

Dr. Daguenet reports two cases of *alcoholic amblyopia, with remarks on the chromatic troubles of such patients, and prognosis and treatment.*

Dr. Schirmer, of Greifswalde, contributes a paper on the "*History of Astigmatism and Hypermetropia*," which must be added to Javal's "History and Bibliography of Astigmatism," in the Annales, October, 1866. Dr. Schirmer mentions a publication of Sachs, a private teacher in Erlangen, who, as also his sister, were albinos. This appeared in 1812, and has remained almost unnoticed, although it gave an account of the

author's eyes and those of his sisters, and described astigmatism and hypermetropia.

Dr. Knapp's "Embolic Affections of the Eye" is republished from the New York Medical Journal, of March, 1869.

Dr. Hairion, of Louvain, contributes a paper on "*Palpebral Granulations*," which will interest military surgeons and those in charge of institutions where large numbers of people are crowded together.

Dr. Anagnostakis, of Athens, contributes two interesting articles on ophthalmic surgery among the ancients.

Dr. Argyl Robertson's article on *ocular symptoms in spinal affections* is translated from the Edinburgh Medical Journal.

Mr. W. Soelberg Wells reports a case of *enucleation of the globe for melanotic sarcoma of the ciliary body appearing in the anterior chamber*. No return of the disease in the patient, æt. 39, within nine months; the iris and choroid were not involved.

Action of atropine on intra-ocular pressure, Dr. Adamuk, of Kazan. This must be taken together with his previously published articles. He holds that intra-ocular pressure depends on the lateral pressure in the blood vessels, hence a decrease of the latter would cause a diminution of the former. But, again, diminution may depend on increased tonicity of the intra-ocular vessels. The ordinary application of atropine cannot produce less lateral pressure in the general vascular system. As there is no means of directly measuring the augmented tonicity of the vessels in the eye—that is to say, their diminution of calibre—we can get at it only indirectly, by studying the act of filtration, which may be considered as being inversely proportional to the tonicity of the vessels. Now, under atropine, this filtration always diminishes. The atropine acts as an irritant on the vessels, and not by paralyzing them. The author explains also the effect on accommodation. One point is so important that we quote his exact words. He uses the word *filtration*, as it is a mechanical act, rather than *secretion*, which is a physiological process.

"I should add that the quality of the substance filtered in an atropined eye is in harmony with this action of atropine on the vessels, for it is always less plastic than the *filtrate* of an eye

not atropined. These changes of the filtration under the influence of atropine are very useful in cases where the crystalline or the whole globe has been seriously injured. The thickening of the vascular walls from contraction by this substance, in diminishing the plasticity of the filtrate renders less dangerous the organization of the globules of the injured crystalline, or extravasated blood, and thereby contributes less to the production of false membranes or other formations known as secondary cataract. Hence it is desirable for oculists to use atropine freely, when the chambers of the eye are open, although some schools condemn the practice."

Zehender's Klinische Monatsblätter für Augenheilkunde, 1869–70.

There are a large number of interesting clinical observations in this journal, beside the original contributions, from which we select the following.

"*Diagnosis of latent hypermetropia*," by Dr. Berlin, who says that some time since Donders spoke of a case of asthenopia from hypermetropia, in which the latent hypermetropia was made manifest by prisms, and Javal noticed, with his instrument for measuring astigmatism, that sometimes a gradual moving off of the object rendered the latent hypermetropia manifest. By both experiment and reckoning Dr. Berlin found prismatic glasses of 6° for each eye rendered the optic axes parallel for 20″ distance. Find now the binocular far point, with convex 10, in an emmetrope, myope or hypermetrope; move then the object a little further off, till the circles of dispersion commence to produce disturbance. If we now add the prismatic glasses above mentioned, the patient will always say he sees better; the text becomes larger and more distinct. As we know, this increase of size is mostly apparent, dependent on the altered taxation from change of direction of the optic axes. It depends in small part, which here is of no consequence, also on the really larger retinal image, since by less convergence from altered relative accommodation the lens may become flatter. It is this relaxation of the accommodation which increases the vision. Hence we find that with these abducting prisms the binocular far point recedes. In short, we

have here a practical method of finding latent hypermetropia without the sometimes objectionable use of atropine.

Tumors of the orbit and globe. Dr. J. Hirschberg. The causes of amblyopia or blindness with these tumors were found to be: *a*, lifting up of the retina or choroid with or without flattening of the sclera; *b*, ischæmia retinæ, seen, however, as spontaneous arterial pulse accompanying congested papilla (stauungspapilla); *c*, atrophy of the optic nerve, either primary, from pressure or stretching, which the optic withstands for a considerable time, or consecutive after inflammatory processes; *d*, retrobulbous neuritis, neuritis descendens, neuroretinitis, stauungspapilla; *e*, substitution of neoplastic for nerve tissue, as, for instance, in myxoma of the optic.

Diphtheritic conjunctivitis. Prof. F. Horner observed an epidemic of this at Zurich. He says conclusions could not be drawn from so small material, and indications for treatment of sporadic cases cannot be determined from the generally much severer epidemics. He observes, however, that mercury and the ice treatment were of but little avail and did not prevent return or relapse. With increasing inflammation he would use ice, but soon change it for the warmth so favorable to the corneal vascularity. Mercurials are not adapted to the children already suffering generally, and he prefers large doses of quinine, as used in diphtheritic angina. If the conjunctival process is perfectly local, and runs its course without fever, local and dietetic treatment suffice.

A peculiar form of ptosis. Dr. F. Horner, from the symptoms and his experiments, deduced the partial ptosis to be dependent on paralysis of the organic musc. palpebral super. (H. Müller, Harling) supplied by the sympathetic, and thus the appearance of the upper lid was connected with the whole set of symptoms.

Blepharitis ciliaris. Dr. J. Stilling attributes this to the ciliæ, which should have fallen out, remaining too long and acting like a foreign body in the lid, causing photophobia, epiphora, and even asthenopia, to a degree that excites suspicion of hypermetropia. Removal of these ciliæ, which come out on the gentlest pull, relieves all these symptoms.

Anatomy of sympathetic inflammation. Dr. J. Hirschberg says: from the result of his microscopic examination, that in sympathetic inflammation the ciliary nerves remain perfectly normal in structure, as many other observers have seen, and as he found in a case where the primary injury dated back seven years.

Description of a new ophthalmometer, by Dr. Emil Emmert, and *still another ophthalmometer*, by Dr. W. Zehender, we must simply refer to, as an intelligible description requires the cuts accompanying them.

The success of the new method of operating for cataract. Dr. J. Stilling attributes this to their being, so to speak, subcutaneous. The conjunctiva lies over the wound and quickly heals by first intention, or by an intervening product, such as we see between the separated parts in tenotomy or circumcision. Thus there is a protecting cover for the deeper sclerocorneal cut, preventing the mucus and tears from inducing pus formation, and so the junction of the separated surfaces takes place undisturbed.

Peripheric linear extraction of cataract. Prof. Græfe, in a letter to Zehender says: he has had recent opportunity to observe the carrying out of this operation among many of his colleagues, and he desires to call special attention to the after-treatment. He holds: 1st. That a fine and soft material must be used for the padding, and not a coarse charpie with hard thread. 2d. This padding must be carefully applied so as to present an even surface, the convexity of the globe not being felt, and the patient should not experience the slightest pain on gentle pressure over the pad. 3d. The bandage must not simply retain the padding, but evenly support the globe all over, from the lower to the upper commissure. Græfe also calls attention to the pain after operation, its character and amount, and what it indicates. He dwells on the after-treatment, the necessity for opiates, chloral hydrate, et cetera. He finally says: "There are, of course, many individualities and considerations to be observed in the after-treatment. Our anxiety is during the first few days. Remembering that the happiness of a human life depends on this, should stimulate and increase our care; the time when our care and anxiety is taxed being much

less than in the old methods. If the first 24 hours have passed without indication of suppuration of the wound, it is, with proper caution, hardly to be longer feared. After 3 to 4 days we need but the exclusion of injury and the use of atropine collyria. This latter in a normal course, and only when cortical remains ; I do not use it till the third day. Unless specially contra-indicated by the conjunctiva not bearing it, I let the bandage remain during the first week, to avoid injury. It should not be suddenly removed, but gradually, for a few hours or so. Even now in winter, the majority of our patients, those also who had both eyes operated on, are dismissed before the end of the second week.

However much Prof. Græfe's advice differs from others, we must remember it comes from the originator of the operation, induced from his own personal experience and the opportunity he has recently had to observe others' practice with which he did not coincide.

Archive for Ophthalmology. Allt, Donders, Græfe. *Vol.* 15, *parts* 2 *and* 3, 1869.

This journal stands so confessedly at the head of ophthalmic literature, that we feel constrained to give at least a very brief summary or sketch of the papers these numbers contain.

Dr. Iwanoff opens with *contributions to the normal and pathological anatomy of the eye.* First, *Loosening* (ablösung) *of the vitreous.* By a series of careful examinations of enucleated eyes, Iwanoff has apparently proved the existence of such a condition as loosening or separation of the vitreous, quite distinct from its breaking down or becoming fluid, just as we have separation of the retina. This separation induces separation of the retina. In myopic eyes, he thinks, it is the cause of the retinal separation, or precedes it. This separation of the vitreous he shows to be a very dangerous thing for the eye, as it is but a prodrome of retinal separation. Since now *loss* of vitreous is frequently followed by separation of other portions of it from the retina, and this leads to the latter separating from the choroid, we see the danger of loss of vitreous in cataract extraction. Iwanoff's cases prove that we can no longer regard this accident with complacency. "A success-

fully terminated operation, normal healing of the wound, even a satisfactory degree of vision at first, do not insure the future when vitreous has been lost. This separation of the vitreous caused thereby renders the prognosis doubtful."

Not only in myopia, wounds of the eyes, etc., but also with choroidal tumors, separation of the vitreous precedes that of the retina.

Glioma of the retina. Dr. Iwanoff, from his own and the researches of Virchow, Knapp, Hirschberg, Schweigger and Manfredi, deduces the conclusion that all the cells of the retinal nerve structure afford material for the development of glioma tumors; and therefore restricting glioma formation to one or the other of the layers is not possible. As to the question of the original development of glioma, it is of special interest to note that it may commence, as was said, sometimes in one, sometimes in another layer, and that the tumor may develope like *retinitis interstitialis*, in which *locality* gives special characteristic peculiarity.

Œdema of the retina. Dr. Iwanoff has examined quite a number of eyes in reference to this pathological condition, and says that a process which is so frequent should not be oftener diagnosticated, seems strange. This he explains by the fact that it generally affects the periphery, and is not accompanied with pain, while it restricts the visual field but little. It moreover is too far forward for the ophthalmoscope to readily show it, but when it extends backward 5, 8, 10‴ from the ora serrata, it may be readily seen, unless, as is then probable, lenticular opacity intervenes. Mauthner alone describes the ophthalmoscopic picture of retinal œdema, which of course may produce separation from the choroid. His observations and Leber's, together with those of Iwanoff, constitute the present literature of this process, which is a very important one, as it may explain conditions hitherto observed and differently diagnosticated.

Dr. J. A. Estlander, of Helsingfors, Finnland, contributes a paper on *choroiditis after relapsing fever.* For the last ten years Finnland has, from climatic changes, suffered from lack of vegetable products, grain and potato diseases, et cetera, causing new and unusual affections to appear, among which is " re-

lapsing fever." This disease has been, as elsewhere, accompanied by a sequela of choroiditis. Such a form of choroiditis has been described before, especially by Mackenzie, with whose data and results those of Estlander remarkably agree. He found the disease to end, among the cases he saw, in posterior synechiæ, which atropine would not break, and ulceration of the cornea, with rupture and loss of the lens. In neither of the cases had treatment been employed. He, however, never observed total atresia of the pupil or amaurotic changes of the retina reported by Mackenzie. With treatment he regards the prognosis good, and even without it he thinks the majority of cases will get on, but require a longer time, while the patient runs greater danger of losing his eye. In treatment he differs essentially from Mackenzie, experience having taught him to put his greatest and only trust in atropine solutions.

Dr. Woinow, of Moscow, on *determining the acuteness of vision in ametropia.* He says, in the usual test the effect of the glass has been neglected, when in reality convex glasses increase and concave diminish the visual angle. This change is not only dependent on the strength of the glass, but also on its distance from the anterior nodal point. Hence an ametrope with a glass is not in the same condition as an emmetrope, and his acuity of vision cannot be measured without considering the above alteration. Dr. Woinow has calculated, and gives in two tables, the increase and decrease of the visual angle for positive and negative glasses from 1-96 to 1-2, and the increase and decrease of the vision of an eye having V=1=20-20, when armed with the glasses at distances of one-half, three-fourths and one inch from the nodal point.

Dr. Woinow also gives a paper on "*vision with the blind spot.*" He made at least ten experiments in each direction as carefully as possible, and found that *dimension* in the neighborhood of the blind spot was never smaller than in reality. This was true of the apparent as well as the absolute size, thus refuting, for his eye, at least, Wittich and Funke's results. From his experiments he finds none of the given theories in reference to filling out of the blind spot applicable to his eyes. Using Helmholz's expression, he says: "I see nothing at the place of defect. I do not see, therefore, that which in any

way fills out this place of defect or blind spot. By nothing, I mean all that which lies out of the range of our perception, of which we have no definite conception, because we do not feel it. In this question only two things enter, either light with its colors and the appearance of its objects, or absence of light—darkness. Now, neither one nor the other exists in the blind spot. There is an absence of all objective sensation in vision; we simply see nothing. As this nothing, however, is for us something incomprehensible, not comparable with any impression, not perceptible, I think it cannot be supplied by any perception. As we cannot in any way become cognizant of its presence, we cannot characterize its properties; we have no special sensation so to do. Thus this defect in our field of vision from the blind spot cannot be filled out by any thing; in the fullest sense of the word, it is a defect or blank in our objective perception. We do not notice it because, first, the spot plays a subordinate part in the act of vision (it falls generally on a part of the picture observed, which is filled out by our imagination). Secondly, as we are not able to take cognizance of it, knowing that only that what we saw before becomes unseen when it falls at the point of the blind spot or defect, we in reality see nothing at this place, but imagine involuntarily the background and the objects which are around the defect; we picture them to ourselves without in reality perceiving them."

Dr. Woinow also, from experiments, replies to the "*question of accommodation*" thus: "An irregular contraction of the ciliary muscle is possible, and its effect is an irregular curving of the surface of the lens in different meridians." His experiments show that this may occur independently of the will, toward the middle and end of the experiment, when the eye is already somewhat tired. The appearance, with Dr. Woinow, lasted from 1 to 4 seconds, which shows the spastic character of the contraction.

Drs. Heymann and Fiedler report a case of *retinal glioma with numerous metastases*. They conclude that the ideas of Dr. Knapp, in reference to the spreading of infection, cannot hold for distant metastases. Knapp thinks that infection occurs by contact of the retinal glioma with the choroid, a single

glioma cell bedded in the choroidal epithelium being enough to ramify by growth the whole choroidal tissue. These writers say, now, that this may hold for the globe and its contents, but cannot for distant metastases. In their case they admit that although a tumor in the left sella turcica joined the degeneration of the left optic nerve, yet the spreading of the growth through the chiasma to the other eye was both clinically and anatomically excluded. Therefore the formation of distant, numerous and scattered metastases are only explainable by the passing along of similar glioma cells through the stream of the fluids. Such passage most probably occurs during the period of softening. To these the metastases in their case completely correspond. If glioma cells wander through the body, these local causes alone determine where they stop and develope. Thus they would explain in their case the nearly synchronous development at the base of the brain, in the anterior lobes, in the retro-peritoneal glands, while another stream carried new seeds to the ovaries, diploe, et cetera.

But still, they say, this does not explain the retinal glioma of the right eye. Here, as in all glioma of the retina, the primary mass does not lie near or in direct contact with the vessels. It is the granular layer that commences to grow, and this is without vessels. The origin of the glioma must be sought, therefore, in the germ we as yet know nothing of, which must be accepted as the germ from which glioma originates in the human organism. The later but independent appearance of the glioma of the second eye was due to that unknown disposition inherent in both retinæ which caused the first breaking out of the disease. All extra-ocular metastases *may* be regarded as resulting from broken-off glioma germs, but a more independent origin must be given to retinal glioma.

Dr. H. Schmidt, Berlin, contributes the result of his experiments in reference to the "*origin of neuritis optica intra-ocularis in cerebral affections.*" Contrary to the recent results of Schwalbe, he finds a solution of Berlin blue injected under the dura mater does not flow out into the orbit. It passes into the loose connective tissue of the optic nerve sheath, does not pass into the sclerotic or Tenon's capsule. The injected fluid fills the lamina cribrosa. It does not enter the papilla except at

the periphery ; slight streaks may sometimes be seen running along a nerve bundle here and there. Hence it seems proved that the lamina cribrosa contains a system of canals in direct connection with the arachnoid space. Thus intra-cranial pressure will drive fluid into these canals. If, then, the cranium is constantly filled with fluid, a slight increase of it will produce swelling and pressure in the lamina cribrosa. A natural consequence of this œdema is incarceration of the intra-ocular end of the optic nerve, and the symptoms of inflammation dependent thereon (stauungs-papille). We have therefore ample cause for the anatomical condition of the papilla, such as Leber described, with neuritis intra-ocularis, without being obliged to assume a neuritis descendens. Why we do not always have a *stauungs-papille* with increased intra-cranial pressure, but sometimes simply white atrophy, the author explains by the fact that the compression, whether direct from a tumor, or in any other way, cuts off at the foramen opticum the communication between the arachnoid space and the optic nerve sheath. The entrance of further fluid is thereby prevented, and thus also, the exciting cause of the stasis of the papilla.

Dr. Snellen has given his results in reference to the *direction of the principal meridians in astigmatic eyes.* In 472 eyes the greatest curve was vertical 238 times, horizontal 43 times, in other directions 191 times. When not vertical or horizontal, it was indefinitely in any other direction. He suggests the lid-pressure would account for the greater vertical curve. Increasing this pressure does increase the corneal curve. Congenital ptosis is accompanied by appreciable change of corneal curve. Muscular pressure of the recti, when unevenly developed as to strength, may produce astigmatism.

Dr. J. J. Müller contributes a very interesting article on *the theory of colors.* We can but quote his concluding sentence : "The physiological theory of colors gives the eye, in distinguishing in the impression of light the three qualities of color, tone, depth or saturation, and brightness, the power alone of distinguishing intensities of impression. Hence, if the intensity of the impression is granted to be a measurable quantity, then color, tone and depth of saturation must be also. We have, however (in this article), shown the measurability of the in-

tensity. Thus is proved our proposition, that the perception of color is a composite of three dimensions. It is interesting that, according to the physiological theory of colors, the variables of the composite are quantities of the same kind, exactly as with space."

Dr. Leber on *retinitis pigmentosa and congenital amaurosis.* He was fortunate enough to make the post mortem examination of an eye in which the ophthalmoscope had diagnosticated retinitis pigmentosa. After a long and careful microscopic examination, Leber concludes that, according to our present terminology, this process must be regarded as a *chorio-retinitis pigmentosa.* From the advanced condition of the morbid process he could not definitely fix on its origin—*i. e.*, whether this was in the retina or choroid. From its greater amount in the retina he was inclined to place it there.

Dr. Leber also contributes a paper on *anomalies of color perception in affections of the eye, with remarks on some forms of amblyopia.* Every contribution to this subject we must accept with thanks to the investigator for his patient observations. In 36 cases of optic nerve atrophy, color blindness, Dr. Leber found to be almost constantly present. As to character, it generally was nearest congenital red blindness. It resembled also the condition of a normal eye when the illumination is reduced, as was long ago noticed by Dove, thus also supporting Helmholz's statement that the perceptive power for various colored light is a function dependent on the intensity of illumination. With weak light the sensation of blue prevails ; in stronger illumination, red or yellow.

In three cases of hemiopia there was no disturbance of color perception in the normal portion of the field of vision. In one case of *amblyopia hysterica* he found no color blindness, contrary to Galezowski's experience. In simple amblyopia without limitation of the visual field, as from tobacco, alcohol and other poisons, we have as a rule no, or but slight, trouble with color perception. In amblyopia with definitely bounded central scotoma, the examination for color perception affords us a handy and certain method of determining the existence of these central darkenings. In both simple amblyopia and with central scotoma the character of the color blindness is the same,

and similar to that with optic atrophy, decreasing from the red to the violet end of the spectrum to final complete disappearance.

Dr. Leber also briefly mentions cases of acquired color blindness without amblyopia, which he refers to central affections. As to the diseases of the eye, he found color blindness in inflammation of the choroid and retina. None in *typical;* marked in *atypical* retinitis pigmentosa. Present in 3 out of 4 retinal separations.

Prof. A. von Græfe publishes a paper on the *pathology and treatment of glaucoma*. This valuable article needs rather to be read than sketched, as it is some 150 pages. Græfe calls the attention of those who have not substantiated his observations to the following points. In primary inflammatory glaucoma—

1st. The succession spoken of, namely, glaucomatous appearances in the second eye during the first two weeks after iridectomy on the first, is only meant where an eye with *primary inflammatory glaucoma* is operated on during the period of irritation. In the so-called non-inflammatory and secondary glaucoma, Græfe has not seen the succession in dispute. 2d. This succession is so frequent as not to be attributable to accidental coincidence, where, under the given conditions, the second eye showed prodromous signs. Here, the marked glaucomatous impulse on the second eye during the first two weeks was seen in 25 per cent. of the patients operated on, and within the last two years more than 30 per cent. 3d. Where the second eye was quite free from prodromous symptoms, Græfe has seen it frequently affected shortly after operation on the first, somewhere about 10 per cent.

This succession, which affects the surgeon's prognosis, Græfe says he would explain, not by the idea that checking the glaucomatous condition in one eye favored its appearing in the other, but, as he has said, the traumatic irritation of the iridectomy, and the accompanying processes of healing, affect the other eye, and wake up there the already present disposition. This disposition of the second eye also reaching its maximum during the first days after the operation (second to the fourth) also points towards such conclusion, as does the accumulation

of the prodromous symptoms during the first two days after iridectomy, which were not previously present, or so marked.

We omit quoting from his remarks on secondary glaucoma, and introduce here what he says in reference to the operation of iridectomy. The rule to excise the iris widely and to its periphery, has not the same force in all cases. To this rule must be added another, namely, that the iris must be most carefully removed from the wound, for any inclusion of the iris causes that which we are contending against, the *secretory irritability* of the eye. An iridectomy not reaching to the periphery, but clear of inclusion, is better than one quite up to the sclera, but with the iris, as it may readily be, broadly fastened in the wound. The operation of iridectomy is not properly completed till the perfect freeing of the iris from the canal of the wound has been accomplished. As Græfe says, fortunately for glaucomatous patients, practice may advance on empirical principals independently of theory.

Drs. Schmidt and Wegner report two cases showing *the similarity of the neuro-retinitis in cerebral tumors and Bright's disease.* Their results would show that a careful and exact etiological examination is not possible at a certain height of the inflammation. This is of importance, when we remember that even now, every specific constitutional affection must have its definite form of retinal inflammation, and even keep to definite alterations. We can, however, generally determine whether optic nerve or retina was first attacked, and even when the ophthalmoscope cannot decide this, the histological result may assist. At least they found that swelling of the papilla and neighborhood in neuro-retinitis albuminurica was dependent on excessive hypertrophy of the radial fibres of the outer retinal layers, on the one hand, and on the other, when of cerebral origin, the swelling was due to hypertrophy of the papilla and the internal nerve fibre layers.

Prof. Saemisch, of Bonn, reports a case of *coloboma oculi*, the first recorded where there was an extensive coloboma of the choroid but none of the iris.

Dr. W. Bezold has a short article on the *objective representation of circles of dispersion*, which is an addition to his former contribution in the previous number of the Archive. Phantom

pictures are obtained by regarding certain figures at distances for which the eye cannot accommodate. These show also the chromatic aberration of the eye. That these are true circles of dispersion he objectively proves by means of a lens. The exact method requires a diagram to explain it.

Dr. Iwanoff on the *anatomy of the ciliary muscle.* He says truly, that nowhere perhaps in the body do the requirements of physiology demand such an exact holding to a standard anatomical formation as in the eye. Yet in examining the ciliary muscle, he found, contrary to all expectation, that the difference between the myopic and the hypermetopic was not so much quantitative as qualitative. A myope's ciliary muscle is not simply atrophied, only the circular bundles are affected, whilst the longitudinal ones are if anything hypertrophied. The reverse holds good of hypermetropes. Here, also, we find one portion only of the muscle hypertrophied, namely, the circular bundles. These facts open some interesting discussions in reference to negative accommodation, which we do not here follow out.

Dr. J. Stilling publishes his *studies of the structure of the vitreous.* From these he thinks we are allowed to consider the vitreous as composed of a cortical substance and a nucleus. The latter having a higher power of refraction. A central canal passes through the vitreous near the boundary between cortical and nucleus, parallel with and to one side of the sagittal axis. It belongs, however, entirely to the substance of the nucleus. Without the accompanying figures of the author no description would be quite intelligible. Dr. Stilling's observations are a step in progress towards the solution of the anatomical structure of the vitreous.

Archives of Ophthalmology and Otology. Drs. Knapp and Moss. *Vol.* 1, *No.* 2. *The Influence of Spectacles on the Optical Constants and Visual Acuteness of the Eye.* Dr. H. Knapp.

Recapitulation of his investigations is as follows: Spectacle glasses, held half an inch before the eye, do not change the situation of its anterior cardinal points, nor its anterior and posterior focal lengths, but the situation of each of the posterior cardinal points is altered in such a manner that convex lenses make them advance, and concave glasses make them recede by the same quantity. Hence the images of all the ob-

ject points, except the one situate in the axis, are displaced, namely, removed from the axis by convex glasses, approximated to it by concave glasses. Thus it is evident that convex glasses cause the image of an object to cover a greater number of percipient retinal elements than if the same object were seen without glasses, whilst the inverse obtains with concave glasses. Dr. Knapp holds that it is wrong to speak of an augmentation or diminution of the visual angle by spectacles, for the visual angle remains unchanged if glasses are worn at the usual distance of half an inch from the eye.

To utilize his calculations he gives a table for our series of test glasses. This table may also be used to determine, with the ophthalmoscope or functional testing, the situation of any part of the fundus oculi with regard to the position of the posterier focal plane. If, for instance, a tumor or a circumscribed exudation projects over the background of the eye, we have first to ascertain with which auxillary glass put behind the ophthalmoscope we can see clearly, by relaxed accommodation and with the upright image, the background of the eye; and, secondly, with which other glass we can see the summit of the projection. The difference of the two glasses will give the height of the elevation by reference to the first and second columns of his table ; a valuable datum in the progress of disease. This table also gives the effect of the glasses in visual acuteness, and to this we can refer to correct our notes, although Dr. Knapp would not propose any change in present methods of ascertaining the power of vision. He has also calculated the effect of glasses on aphakial eyes, and on the acuteness of vision, giving us a table of the results.

Large cyst of the iris cured by operation. Dr. Knapp reports this interesting case. Ordinary print could be read with the eye seven months after the operation. No irritability of either eye, and no cystoid protrusion of the wound. All cysts of the iris hitherto reported (some 22 in number) were, when left untouched, destructive to the eye, and several of them even caused sympathetic inflammation of the other eye, thus warranting Dr. Knapp's early operative interference.

Case of extirpation of a cancroid growth of the inner canthus and upper eyelid. Blepharoplasty by the sliding flaps. Dr.

Knapp reports the case which is analogous to two others reported in the Archives of Ophth., 13, p. 160, and the Archives of Ophth. and Otol., p. 139. A sketch of this present case would require the wood-cuts accompanying the original.

On the measurement of the prominence of the eye. Dr. Keyser. His point to measure from is the edge of the outer wall of the orbital opening, as it is never covered with anything more than thin integument at all times, by lean or fat persons. By his instrument to measure with, which would require the wood-cut to explain, he finds the prominence of the eyeball, in a healthy normal state, to vary from 9 to 18 mm. He found in myopia sometimes no, and sometimes great extension.

Report of a case of detachment of the choroid from the sclerotic after an operation for cataract, with partial loss of vitreous body. Dr. Reuling. On the third day after the operation a delirious patient tore off her bandage and gave rise to gaping of the wound which had promptly and entirely closed, and to hæmorrhage into the anterior chamber. The patient died in three weeks, and examination showed that the separation extended from the circumference of the optic disk to the ciliary ligament, and was complete, so that the jelly-like exudation between the two membranes separated the choroid from the sclerotic over its whole extent to an almost equal degree. The *arteriæ ciliares posticæ brevis*, and the ciliary muscle near the canal of Schlenum, constituted the only connection between sclerotic and choroid. No detachment of the retina was anywhere perceptible. These two membranes were in perfect apposition, and showed no trace of wrinkle. The corpus vitreum was perfectly normal, the microscope showing no change.

The use of acetic acid in affections of the conjunctiva and cornea. B. A. Pope. The acid used was of spec. grav. 1041, and found to be useful in warty degeneration of the palpebral conjunctiva—relaxed condition of the conjunctiva of the cul de sacs with hypertrophy of the epithelial layer—in the stage of development of some cases of trachoma—inflamed pinguecula—in the hypertrophoid condition of the lachrymal caruncle and semilunar folds in cases of pterygium—calcareous degeneration of the epithelial layer of the cornea—and finally in dense opacity of the cornea. Dr. Pope applied the

acid with the smallest size camel's hair brush, which must not hold too much of the fluid, and any moisture should first be removed from the surface to which it is to be applied.

Anœsthesia of the cornea, and concurrent diminution of the action of atropia on the iris, as influencing keratic ulceration. Dr. J. S. Hildreth. The cause is attributed to some *local defect* of nervous action, which belladonna was competent to relieve on the one side, while it failed on the other.

Contributions to physiological optics. Dr. B. A. Pope. This is the continuation of the article entitled "Entoptic Phenomena Connected with the Circulation of the Blood," which appeared in the previous number of this archive.

Melanotic sarcoma of the ciliary body and adjoining choroid. Dr. H. Knapp. The points of interest in the case were: 1st. The detachment of the iris by the inwardly tending growth. When choroidal sarcoma extends to the ciliary body, its elements crowd forward between the sclerotic and ciliary muscle, throwing the latter, as well as the ciliary processes and their continuation, the iris, towards the optic axis. Through the opening thus made, the pseudo-plasma enters the anterior chamber. 2d. The total adhesion of the retina to the choroid and the tumor, a fact at variance with the common belief that detachment of the retina is one of the earliest consequences of intra-ocular tumors. 3d. The formation of a large transparent membrane across the vitreous space, parallel to the plane of the equator, and firmly connected with the retina, its histologic elements being those of the embryonic stage of the vitreous body, namely, mucous tissue, interspersed with a large quantity of physaliphorous cells.

On the pathology of the vitreous. Dr. Pagenstecher, Wiesbaden. From a series of experiments and microscopic studies the following conclusions are arrived at:

1st. That in the vitreous, the gelatinous material, as well as the elements contained in it, be they of what kind they may, are not capable of inflammation from irritating causes sufficient to produce it elsewhere, nor of forming lymphoid corpuscles by morphological changes. From this follows—

2d. That these must immigrate from the surrounding tissues.

3d. That the vitreous remains apparently quite passive,

even under very strong irritation, or, more precisely, that this cannot produce an accumulation of lymphoid corpuscles at the point of irritation, a phenomenon which in a short time follows similar irritation in organs susceptible of inflammation.

4th. That, therefore, the vitreous cannot be said to be susceptible of inflammation in the same sense in which we use that phrase of other organs, but that every so-called inflammation of it is to be considered as a secondary state, depending on the changes in the surrounding tissues.

As to opacities of the vitreous, Dr. Pagenstecher distinguishes three distinct varieties. 1st. Such as must be considered as the product of any inflammatory process in the surrounding membranes. 2d. Such as have arisen from an intraocular hæmorrhage. And 3d. Such as have been produced by the influence of air or a chemical change.

Dr. Pagenstecher also draws attention to the necessity of separating inflammatory products in the vitreous from *coagulations* of the same, and every cloudiness around a foreign body must not be considered as the result of an inflammatory process. His experiments and the results of dissection show that, if as well ophthalmoscopically as later upon dissection, no connection with the internal membranes can be proved, the cloudiness always consists of coagulation, and never of the products of inflammation.

Injury of the left eye; sympathetic ophthalmia of the right; loss of vision in the eye secondarily affected; vision retained in the injured eye. Dr. T. R. Pooley. The heading itself sketches this interesting case.

Cysticercus intra-ocularis. Dr. J. Hirschberg. The cysticercus had developed beneath the retina, had caused total blindness by a complete detachment of the retina, and only after two years' loss of sight had produced, by its very exceptional growth, such violent symptoms of irritation that enucleation of the eye-ball was called for.

Granulation tumors of the iris. Drs. J. Hirschberg and Steinheim. They say, if there were any further proofs needed that the microscopic examination of the neoplastic tissue of itself, without regard to the matrix from which it proceeded, is not sufficient to decide upon the pathological im-

portance of the product, the proof would be furnished in these tumors of the iris. But now further special clinical experience justifies us in the conclusion that, if we find any such unpigmented granulation-like structure in a neoplasm of the iris or ciliary body, we need not fear a recurrence or metastasis in remote organs after the complete removal of the diseased parts. This reason, together with the consideration that the function of the organ is lost in the natural course of the disease, encourages us in surgical interference at an early period, viz., when vision is still good, and which may be preserved by removal of the iris constituting the matrix of the neoplasm.

Do the eyes perform any rotation on the optic axes in lateral inclinations of the head? Dr. J. Aub. By an ingenious mechanical arrangement and experimentation he shows that, in lateral inclinations of the head and straightforward direction of the visual line, the eye does not make any rotation around the optic axis whatever, thereby confirming the statement of Donders and other observers, according to which the eye, in general, follows the lateral inclinations of the head ; but these observers failed to demonstrate that this is done exactly to the same degree. Dr. Aub's experiment seems to prove this also.

The diagnosis of intra-ocular sarcomata. Dr. O. Becker. He says : " Basing upon my own observations and the remarks of other observers, I consider myself entitled to assert that it depends upon the situation of a choroidal sarcoma whether it can be distinguished with certainty, and at an early period, from a detachment of the retina." He adds that Knapp asserts and Græfe concedes, that a sarcoma, taking its origin from the ciliary body, can remain in contact with the retina during the whole period of development and still be diagnosticated, since the occurrence of retinal detachment cannot take place in this situation in consequence of the intimate connection existing between the pars ciliaris retinæ and the corpus ciliare.

Choroidal sarcomata originating in the region of the macula lutea, never produce, by serous effusion, detachment of the retina, dependent probably upon anatomical conditions. It seems thus to be proved that choroidal sarcomata really do ex-

ist during a certain length of time without the supervention of retinal detachment.

In the aspect of choroidal sarcomata of a more advanced stage a marked difference presents itself, depending upon the upper, lower, or lateral intra-ocular origin of the tumor. It cannot be denied that in these cases the retina has nearly always been found somewhat detached from the growing tumor by a serous effusion.

Our report would not be complete were we to omit to notice what is going on in the general ophthalmic world. As items of interest, we would mention the establishment in Madrid, Spain, by the municipal board of charities, of an ophthalmic clinique, over which is placed Dr. Delgado Jugo. For the three summer months a clientale of over 400 patients shows its need and the confidence placed in the ophthalmic surgeon in charge.

During the session of the international medical congress at Florence, in September of last year, a number of Italian ophthalmic surgeons formed themselves into a national ophthalmological society, now numbering some thirty members. Prof. Cesare Paoli is president, and Dr. Enesto Mazzei, secretary. The next meeting is to be held this year from the 15th to the 20th of September, at Florence. Whether other than Italian ophthalmic surgeons are to be admitted to membership, we have not as yet learned. A long and interesting list of subjects for discussion at the coming meeting has been proposed by a committee in charge of the same.

Although some of the great universities still refuse to recognize the position of ophthalmology in medicine and surgery, by establishing chairs of the specialty, yet the student is not entirely without means of learning at least something of it, even on this side of the water, since individual enterprise has in a measure supplied the want plainly felt by the tardy action of the corporate bodies.

Our ophthalmic literature shows what earnest workers and thinkers are among our ranks. Aside from the compendiums and monographs, we may point with satisfactory pride to our journals, the Archiv für Ophthalmologie, the Klinische Monatsblätter für Augenheilkunde, the Annales d'Oculistique, the

Gionnale d'Oftalmologia Italiano, the Ophthalmic Hospital Reports of London, and last, but not least among them, the Archives of Ophthalmology and Otology.

We should here mention that Dr. Hirschberg, No. 5 Ziethenplatz, Berlin, asks for all ophthalmic literature from authors, for the preparation of a review of ophthalmology. All books will be returned to authors, if a request so to do accompanies them.

Closely following our loss in Sichel, we have to record the death of Vlemincks, Van Roosbrœck, Böhm, Van Biervliet and Quadri, names too well known in medicine as well as in our specialty, to require any words of ours to be added to the generous and kindly notice they have received at the hands of friends and colleagues.

Books, Pamphlets, Monographs, and Journal Articles not Noticed in the Report.

Étude sur le Nystagmus. Thèse by A. E. Gadaud. Paris, 1869, p. 158.

De la Paralysie du nerf Moteur Oculaire Commun. Thèse by H. Cassoulet. Paris, 1868.

Du Diognostic des Maladies des Yeux par la Chromatoscopie Retinienne. X. Galezowski. Paris, 1868. With colored figures, colored test types, and a chromatic scale of 44 tints.

Ein Fall von Retinitis leukæmica. Dr. M. Roth. Virchow's Archiv. 1870. p. 441.

Zur Casuistik des Herpes Zoster Frontalis seu ophthalmicus. Inaugural Dissertation. Rudolf Jacksch. Breslau, 1869. 50 cases.

Iridesis od Iridencleisis. Prof. M. del Monte. Naples. Movimento Medico-Chirurgico.

Della fistola artificiale della cornea né casi di cecita per incurabile alterazioni corneali. Dr. P. Gradenigo. Gazetta Med. Italiana. Anno xiii, No. 4.

Quelques Considerations sur la Nature et le Traitment du Glaucôme. A. Le Gad. Strasbourg, 1869.

Das Perimeter und seine Anwendung. Carl Möser. Breslau, 1869.

Rendiconto statistico della clinica ottalmica della regia universita degli studi di Napoli. G. Reale. Napoli, 1869.

Cases of Iritis occurring in Syphilis treated without Mercury; with Remarks on this form of Iritis. G. G. Gascoyen, F. R. C. S., Med. Chi. Trans. Vol. 34, 1869.

Faut il opérer l'œil atteint de cancer de la retine? Dr. Fano. Union Medicale, Jan. 15, 1870.

Atlas d' Ophthalmoscopie. Dr. R. Liebreich. Second edition. Paris, 1870.

Ophthalmoskopischer Hand Atlas. Edward von Jäger. Wien, 1869.

Saggio di studi sulle mallattie delle vie lagrimali. Prof. G. Rava.

Del Glaucoma. Enrico Velardi. Napoli, 1869.

Un caso di glioma ascendente della retina. Dr. G. Arcoleo. 1869.

Sulla cura del cherato cono. Dr. R. Secondi. 1869.

Dell 'uso del caldo umido. Dr. G. Rava. 1869.

Congenital Cataract in Children simulating Nearsightedness. Dr. B. Joy Jeffries. Boston Med. and Surg. Journal, Oct. 7, 1869.

New Test for Mixed Astigmatism. Mr. Cowper. Med. Times, Jan. 30, 1869.

Chromatoscopy. Dr. Wolfe. Lancet, Feb. 13, 1869.

Healthy Children of Syphilitic Mother. Dr. Charteris. Lancet, Jan. 30, 1869.

Electrization of Paralyzed Muscles in Strabismus. R. B. Carter. Lancet, Jan. 2, 1869.

Ophthalmiscopic Signs of Tubercular Meningitis. T. C. Allbutt. Lancet, May 1 and 8, 1869.

Chromidrosis, two Cases of. Dr. A. W. Foote. Dublin Quart., Aug., 1869.

Ueber die Nerven der Conjunctiva und Sclera. F. Helferich. Wurzburg, 1870.

Zwei Fälle von Sarkoma der Retina. E. Emmert. Bern., 1870.

Uebersicht über die Wirksamkeit der Augenklinik. G. Schmitz. Cöln, 1869.

Annual Report (the First) of the Surgeons of the Philadelphia Eye and Ear Infirmary for the year 1869.

Observations and Researches in Albinism in the Negro Race. J. Jones. Philadelphia, 1869.

Vereeniging tot het Verleenen von hulp aan minvermogende Ooglijders vor Zuid-Holland. 4te Verslag. Rotterdam, 1869.

Ueber Einige der häufigsten Krankheiten und Formfehler des Auges. Prof. H. Dor. Bern.

De la nevrite et perinévrite optique et de ses rapports avec les affections cerebrales. Archiv Gen. de Méd., 1868 and 1869. Dr. Galezowski.

Eye Symptoms in Spinal Diseases. Dr. A. Robertson. Edin. Med. Jour., Feb., 1869.

Der Farbensinn. Dr. A. Nagel. Berlin, 1869.

Die Kurzsichtigkeit, ihre Ursachen und Folgen. Basel, 1869.

Die Orbitalvenen des Menschen und ihr Zusammenhang mit den Oberflächlichen Venen des Kopfes. Emil Sesemann. 1869.

Behandlung des Entropium. L. Th. Beck. Leipzig, 1869.

Anat. Untersuch. Eines Augapfel's mit subretinalem Cysticercus. J. Hirschberg. Virchow's Archiv, B. 45, p. 509.

Oedema of Conjunctiva as a Symptom of Surgical Fever. Lawson. Edin. Med., No. 165.

Ueber Gewisse Innervations-störungen bei der Basedow 'schen Krankheit Stellwag von Carion. Wien. Med. Jahrb, B. 17, 1869.

Vereinfachung der Operation einer künstlicher Pupillenbildung. L. Wecker. Gazette hebdomadaire, No. 9, Feb. 26, 1869.

Zur Pathologie des körnigen Conjunctivaltrachoms. Dr. Wolfing. Sketch of this by Dr. J. Talko, of Tiflis, in Monatsblätern. 1869, p. 112.

Heteropthalmus bei angeborener Katarakt. Talko, 1869.

Hydropthalmus congenitus. Zurüch, 1870. W. Muralt.

Ulcus Corneæ Serpens und seine Therapie. T. Sämisch. 1870.

Ein neues Verfahren, die Simulation monoculären Blindheit zu ermitteln.

Dr. H. Berthold. Monatsblätter f. Augenheilkunde, 1869, p. 300.

Neue Art der stereoskopischen Wahrnehmung. Listing. Gottingen, 1869.

Hæmorrhagia Retinæ als Vorbote einer tödlich verlaufenen Apoplexie. Dr. E. Berthold. Berliner Wochenschrift, Sept. 27, 1869.

De canali Petiti et de zonula ciliari. G. Schwalbe. 1870.

Compendium d. Augenheilkunde nach M. Tetzer's system. Vorlagen. I. Grünfeld. Wien, 1869.

Versuche über Hornhaut-entzündung. W. F. Norris and S. Stricker. Wien. 1869.

Die Kurzsichtigkeit ihre Ursachen und Folgen mit besonderer Berücksichtigung der Schule. Populärer Vortrag. Dr. Schies-Gemuseus. Basel, 1869.

Zur Reform des ophthalmologischen Universitäts-Unterrichtes. Dr. J. Jacobson. Erlangen, 1869.

On the Optic Disk and Retina in Acute Iritis. Dr. R. P. Oglesby. Edin. Med., Jan., 1870.

Der Arachnoidealraum ein Lymphraum und sein Zusammenhang mit dem Perichoroidealraum. G. Schwalbe. Centrablatt, f. Med. Miss., 1869, No. 30.

Four Cases of Spinal Myosis. Edin. Med. Journal, Dec., 1869. Dr. Argyll Robertson.

Asthenopia, or Weak Sight. Dr. E. M. Curtis. New York Med. Journal, April, 1870.

On Abscesses and Tumors of the Orbit. Spencer Watson. London, 1870.

Traite pratique d' Ophthalmoscopie et d' Optométrie. Maurice Perrin. Paris, 1870.

Des paralysies des muscles moteurs de l' oeil. A von Græfe. Traduit par A. Sichel. 1870.

Fall von Retinitis leukæmia. Dr. M. Roth. Virchow's Archiv, 1870, p. 441.

Tobacco amaurosis without alcohol. J. Hutchinson. Med. Times and Gazette, Sept. 4, 1869.

Case of Cyst in the Eye. C. K. Fiske. Lancet, Nov. 13, 1869.

Lateral Deviation of the Eyes in Cases of Hemiplegia. H. Jackson. Lancet, Nov. 13, 1869.

Endemic Hemeralopia. Galezowski. Med. Chi. Rev., Jan., 1870.

Retinitis chronica mit Pigmentablageruing in der Retina. Dr. A. Rudnew. Virch. Archiv, B. 48.

Cases of Syphilitic Affection of 3d Nerve, Causing Mydriasis and Ptosis. Bost. Med. Journal, Nov. 6, 1869.

Melanoma der Cornea. Dr. Langhaus. Virch. Archiv., B. 49, p. 117.

Endigung der Nerven im eigentlichen Gewebe und hinteren Epithel der Hornhaut des Frosches. Dr. H. Lipman. Virch. Archiv, 1869, p. 218.

Ueber ein Cancroid der Cornea und Sclera, ein Beitrag zur Entvickelungsgeschichte der Carcinome. Dr. A. Classen. Virch. Archiv, B. 50, Hft. 1.

Experimental-Untersuchung über die Baufehler des menschlichen Auges. Leipzig, 1869. Dr. A. Schumann.

Cyst of the Iris, Cured by Operation, Zinn's Membrane Forming its Anterior Wall. By Charles M. Allin, M. D., Surgeon of the New York Eye and Ear Infirmary, New York City.

Though the subject of cyst of, or in relation with, the iris, is one which has received, particularly recently, considerable attention, I beg leave to report to the Society an additional case which I have had occasion to treat since our last meeting, which presents some features in connection with the mode or point of origin of these tumors somewhat different from those usually exhibited. In the very able "Report on Cases of Cysts in the Iris," by Mr. Hulke, published in the Ophth. Hosp. Reports (vol. vi., pt. 1, page 12), and involving the history of 21 cases, the conclusion arrived at is thus stated: "I., That cysts, in relation with the iris, projecting into the anterior chamber, originate in two situations; 1., in the iris; and 2., in connection with the ciliary processes. The first lie between the *uveal* and the *muscular* stratum of the iris, and are distinguished by the presence of muscular fibres upon their *anterior* wall; the second lie *behind* the iris and bear the uveal as well as muscular strata on their front." And, again, "As regards treatment, ... excision is always preferable, and it is evident that the chances of success will be proportionate to the completeness of the excision, and the practicability of this will vary with the size of the cyst, and the extent of its connections, and with its position *in* or *behind* the iris." (The *italics* are my own.)

Mr. Bowman, also, in his "Lectures, etc.," (page 76), had already said, "It is evident, in this disease, that the *muscular* tissue of the iris is expanded *over* the fluid;" and, "it is also evident that the uvea is not protruded with the muscular tissue, but separated and thrown posteriorly."

On the other hand, M. Wecker, in the first number of the "Archives of Ophthalmology and Otology," edited by Dr. Knapp (page 85), expresses his "opinion that serous cysts are never developed *in* the iris, and the formations which have been called cysts are the results of sacculation of the iris. The serous contents which they contain is the aqueous humor, and

we may, not unjustly, classify these tumors . . . . among the tumors by retention."

The case which I now present it seems difficult to explain thoroughly under either of these heads. The examination of the cyst, which was very carefully made subsequent to its removal, demonstrates pretty clearly, I think, that it was developed between the iris proper and the reflexion of Descemet's membrane on its anterior surface, known as the "membrane of Zinn," pushing the iris *entire* backwards and upwards with such force as to separate it from its ciliary attachment, and to produce by its pressure an atrophied condition of the iris tissue. There was no muscular or other normal tissue of the iris upon the *anterior* wall, but this wall was composed entirely and simply of the very thin and structureless membrane just referred to. The case is of value also as contributing to confirm the existence of this membrane described by Zinn, which is still doubted by many anatomists, among whom I suppose Mr. Bowman desires to be ranked.

It has, however, been also recognized, and its location described by Donders; (Græfe's Archives, vol. 3, part 1, page 150), by Althof; (Græfe's Archives, vol. 8, part 1, page 129), by Luschka, in his work entitled "Die Structur der Serösen Häute des Menschen;" and by A. Vetter, in an article in Græfe's Archives, vol. 6, part 2, page 178, "Ueber Einimpfung von Vaccinelymphe in Kaninchenaugen."

The inference that this cyst did not *necessarily* result from a *sacculation* of the iris seems to be sustained by the facts that though it was developed after a penetrating wound of the eye, and there was undoubtedly at the time of the injury a protrusion of iris through a part of that wound, the resulting synechia was only partial in extent, and the development of the cyst was apparently from a point *distant* from the entangled portion of iris; and also, that though even this synechia was not *entirely* detached at the operation, there has been no return of any "tumor of retention."

With all these objections, however, I cannot positively deny that there *may* have been such a "sacculation" at some point which, in the advanced stage of the cyst when observed by me, could not be located.

Finally, the case is of interest on account of the complete success of the treatment adopted for its cure.

The case is as follows:

Elizabeth Chalmers, 11 years of age, was admitted under my charge at the New York Eye and Ear Infirmary, Nov. 9, 1869, and gave the following history: Four years ago the left eye was wounded by a piece of stone thrown at her, for which injury and its *immediate* consequences she was treated at the Infirmary during nearly three months. No record of the treatment has been preserved, though, from her description, it is probable that a prolapse of the iris through a corneal wound was reduced after repeated tappings. The eye has remained quiet ever since until about five months ago. At this time her father noticed something unusual encroaching upon the pupil, and says that recently this growth has *rapidly* increased in size. There is *now* a cicatricial linear opacity of the cornea, extending from the lower and outer margin, upward and inward, nearly half the diameter of the cornea. The iris is apparently attached to this cicatrix only for about a line at its upper and inner portion. On either side of the opacity are developed what seem to be two separate cyst-like masses, which together fill the lower three-fifths of the anterior chamber. The mass on the temporal side is the smaller, about 2‴ in diameter, and somewhat flattened; that on the inner side is twice the size of the other, or 4‴ in diameter, and is globular in form. The free portion of the iris above is active, but the pupil is distorted by the encroachment of the largest tumor. The anterior chamber in that portion not occupied by the tumors has its normal appearance. The anterior surface of the iris is seen through the mass at the inner and upper portion, but it is evidently pushed backwards and upwards, so as partly to overlap and lie in folds upon the tumors. The tumors are transparent, though with the ophthalmoscope no reflex from the fundus can be perceived through them. Vision = $\frac{5}{200}$.

On the 2d of December the cysts had decidedly increased in size, pushing still farther upwards the pupil, and there was now considerable keratitis, giving an *appearance* of commencing opacity of the contents of the tumors. She complained of

some pain in the eye, most severe at night, and there was some photophobia, with lachrymation.

On the 10th of December, the patient still complaining of increased pain and photophobia, though the eye *showed* no special change, a consultation with the entire surgical staff of the Infirmary resulted in an agreement as to the *diagnosis* of cystic tumors in relation with the iris, but a diversity of opinion as to the proper mode of treatment. Two of the Surgeons urgently advised that the eye should either be let alone, or extirpated entire; believing that a simple evacuation of the cysts would be followed by an immediate refilling, and that an attempt at actual removal of the cysts themselves would result in destruction of the eye, and necessitate an ultimate extirpation of the globe. All the other Surgeons agreed with me as to the propriety of making an attempt to remove the tumors, though recognizing the very considerable risk incurred thereby.

I accordingly proceeded, on the 15th of December, to perform the operation as follows: The patient being etherized, I commenced an incision, with a lance-shaped iridectomy knife, just back of the corneo-scleral margin, at a point about 2‴ from the inner border of the largest cyst. The knife passed directly into the cyst, and when it had penetrated about 2‴ was withdrawn, and the contents of the tumor, which was perfectly clear, allowed to escape. The walls of both tumors immediately collapsed, showing that there was in fact but *one* cyst, and that the constriction produced by the corneal cicatrix had given the impression of the two separate bodies. It was now seen that a dialysis of the iris had been produced by the development of the cyst, extending about one-fourth of the periphery. The pupil assumed a more central position, though now drawn down somewhat by the synechiæ on both sides of the corneal cicatrix. The incision was now extended with scissors along the lower border of the cornea, across and beyond the corneal cicatrix, nearly to the extreme limit of the dialysis of the iris. Then with an iridectomy forceps the cyst wall was seized at the inner border of the wound, and very carefully removed by successive cuts with the scissors, and with very little traction. The anterior synechia on the

inner side was completely divided, but that to the outer side was left attached. The removal of the cyst proper seemed to be complete.

A solution of atropine (gr. iv ad ℥j) was dropped into the eye and an elastic bandage carefully applied. The bandage was removed at the end of four hours, a solution of atropine (gr. viij ad ℥j) used every fifteen minutes for an hour, and the bandage reapplied. This was repeated at bedtime.

She had no discomfort during the night, but in the morning she had slight pain in the brow. Twenty-four hours after the operation I examined the eye. The cornea was perfectly clear, the edges of the wound adherent, and the anterior chamber filled. She exhibited thereafter no unpleasant symptom whatever. On the 19th, four days after the operation, I relinquished the bandages altogether, and on the following day she could read No. 3½ of Snellen at 8″. The patient has been under frequent observation ever since, and up to the present time, July 15, 1870, there has been no evidence of any disposition to refilling of the cyst.*

The mass removed with the forceps was placed in the possession of my esteemed friend, Dr. Althof, the Curator of the Infirmary, who made a very thorough microscopic examination of it, and has very kindly given me the following report:

"The specimen referred to me for examination, 4½ mm. long and 3 wide, presents the appearance in water of a floating veil woven of two different kinds of material, one perfectly transparent and apparently structureless; the other composed of thin filmy layers of some tissue which easily separates when dragged through the water, or treated with the camel's hair brush. Under the microscope (×270) the transparent portions do not show any structure whatever, and resemble a regular "glass membrane" of the eye. Very thin cuts show its surface to be here and there somewhat rough, and at one point there was a pretty large protuberance surrounded by some minor ones looking very much like the elevations on the "glass lamella" of the choroid. This structureless membrane varies

* *Nov.* 15, 1870.—The patient has again been carefully examined to-day, and there is still no change in the appearance of the eye.

considerably in thickness, but on neither surface does imbibition with carmine show any distinct traces of cells, besides the above mentioned masses.

The other part of the specimen differs greatly in structure. It consists partly of thin, closely interwoven fibres, as irregular as a mass of fungi, forming an apparently very strong network. In spite of very prolonged and careful tearing I could not make out what character those elements had. This tissue could be easily followed up into another, consisting of cellular tissue interspersed with numerous pigment corpuscles in large and small collections, the remnants, as I believe, of the pigment cells of the iris, although they might be the result of hemorrhage. There could of course be no doubt as to the character of the latter tissue. It was atrophied iris. Following it farther up, the latter showed more and more its normal character, although I did not find it in any spot *perfectly* healthy. The uveal pigment layer was nowhere visible, neither did I find the well-known structure of the pupillary edge. The best conserved parts showed on transverse section, here and there, a layer which looked exactly like the structureless membrane above alluded to, and in this fact I thought I found an explanation for the genesis of the cyst.

"I believe that the above described structureless membrane was the 'membrana Zinnii' in whose existence I firmly believe; that it had been lifted up from its base in the development of the disease and served as the anterior wall of the cyst, the posterior wall being formed of the atrophied tissue proper of the iris. The 'protuberances' observed may possibly be looked upon as remnants of the epithelial layer which covers the surface of Zinn's membrane till near the pupillary margin.

If this opinion in regard to the pathogenesis of this cyst is the right one, the case offers a good prospect for a permanent recovery, a new formation of the cyst being not as probable as in other cases, in which also only a part of the sac has been removed."

42 West 36th Street, *July* 21, 1870.

Cyst of the Iris. (In discussion of Dr. Allin's paper on Cyst of the Iris.) By Dr. H. Knapp.

With reference to Dr. Allin's case, Mr. President, it may warrant sufficient interest to report the course of the iris cyst which I operated on last year, and made mention of at the last meeting of this society. The cyst, being a very large one, had to be removed by two operations, both of which healed well, and the patient returned home cured on the 1st of June, 1869. She lives in Burlington, Iowa. Last winter, when standing on one of the Mississippi bluffs, she exposed herself to a very cold wind, and soon after experienced pain and impairment of vision in her uninjured eye. Having been antiphlogistically treated at home for about three weeks, she came to see me in New York. I found the operated eye in about the same condition as after the recovery from the operations, nor had it suffered in the interim. The other eye showed circum-corneal injection, slight diminution of sight ($S=\frac{2}{4}\frac{0}{0}$), diffuse opacity of the vitreous, and at a distance of two diameters from the optic disc, below the yellow spot—if my memory serves me—a grayish, circumscribed, roundish, slightly prominent choroidal exudation. Having never witnessed this exceedingly rare affection in connection with sympathetic ophthalmia, I thought that also in this instance it was a primary inflammation caused by exposure. I treated her with mild antiphlogistics. The redness around the cornea disappeared in three days, the turbidity of the vitreous cleared up rapidly, and the circumscribed mass in the choroid began to be absorbed, becoming markedly smaller from the periphery, while its original size remained recognizable by a zone of choroidal atrophy. Vision was $\frac{2}{2}\frac{0}{0}$ after a week, when the patient returned home. I was subsequently informed that she recovered completely.

A Case of Cyst of Iris. By Francis Simrock, M. D.

A. K., a healthy girl, æt. 12, met with an accident to her right eye five years ago, by having a pair of scissors thrust into it. For some time a black mass protruded through the wound on the lower border of the cornea, gradually diminishing in size and leaving only a black spot on a level with the

surrounding parts. Vision was not altered till about two months ago, when the child began to complain of pain and indistinctness of sight.

When I first saw the little patient, this black spot, the remnant of a prolapse of iris, was clearly visible on the lower margin of the cornea about a line to the outwards from its vertical diameter, the lower half of the iris being drawn towards it in a sharp angle, the sides of which were formed by the right and left leg of the former prolapse. Between this shortened part of the iris and the cornea a round cystic growth of about the size of a pea was developed, its fundus overlapping a little the normal centre of the pupil, while its lower part seemed to be attached with a base of about $1\frac{1}{2}$ lines in breadth and one line in height, to the anterior surface of the shortened part of the iris. The thin walls of the cyst, as well as its contents, are perfectly transparent, except on the spot where it is attached. After complete dilatation of the pupil, vision of the emmetropic eye is $=\frac{5}{8}$, fundus normal. A protracted treatment of total rest, darkness, the use of atropine, etc., not proving of any avail, and the irritation having gradually increased to such a degree as to interfere with the free use of the other eye, an attempt at removal was decided upon, to be directed principally against that part of the iris from which the cyst was springing. I was well aware that the attachment of the cyst to the surface of the iris, and its further development beneath its epithelial layer, were only secondary events, and that its origin proper had to be looked for further below, in the region of the lig. pectinatum, at the point of the former prolapse. This point, therefore, would have been the best suited for an incision—being convinced, though, that every effort to gain access to the anterior chamber by a scleral section at this spot would surely be followed either by prolapse of vitreous or injury to the wall of the cyst, I gave up the plan of entering through the original wound, and resorted upon an operation warmly recommended for treatment of rebellious partial staphyloma, viz., excision of both the sides of iritic tissue, which form the connection between the prolapse of iris and the iris itself. By gently drawing out the normal tissue of the iris contiguous to the shortened part, I expected to bring out that portion

which contributes to the formation of the base of the cyst, and could not at present be reached on account of being covered by the latter. At the first operation (November, 1869) the scleral incision with the broad iridectomy knife, near the right lower margin of the cornea, was carried up about a line beyond the limits of the cyst, in order to facilitate the excision of a sufficiently large piece of iris. After withdrawing the knife, I divided the portion of the iris appearing in the wound first from its upper connections, then drew it out, together with the right half of that part to which the cyst was attached, taking at the same time as much of the walls of the punctured cyst as I could without violent traction, and cut it off from its lower adherences with the left crus of the former prolapse of iris. Immediately after the operation a good deal of irritation set in, subsiding, though, in a couple of days under energetic use of atropine, without leaving any synechia. A careful examination about two weeks later proved the removal of the whole right half of the base of the cyst, together with everything looking like cyst-wall.

Three months after this the growth reappeared redeveloped to about half its former size. A second operation having been decided upon, the scleral incision was made on the left side of the cornea, followed by immediate rupture of the cyst, whose wall was completely removed, together with the left side of the former prolapse of iris to which it was attached. By these two operations the whole lower third of the iris was excised, leaving no trace of its tissue in front of the lens, the eye showing no signs of irritation, and having improved considerably in sight ($\frac{1}{2}\frac{6}{0}$).

About three weeks ago I again examined the child, and found, to my surprise, that the cyst had grown again, starting from that part of the iris which was squeezed into the scleral wound at the time of the accident. Its size now is that of a small head of a pin.

64 East Twelfth St., New York, *September*, 1870.

Results of Thirteen Passavant Operations for Breaking up Attachments of the Iris to the Capsule of the Lens. By B. Joy Jeffries, M. D., Boston.

Dr. Passavant published an account of his operation in the "Archiv für Ophthalmologic," 1869. This article I translated for the Dec. 23, 1869 No. of the Boston Medical and Surgical Journal, and would refer to it in explanation of the object, method and success of this operation as given by its originator.

Since March 1, 1870, I have performed Passavant's operation thirteen times all told, on four several eyes in three patients, as follows: N. B., a woman aet. 22, has had severe specific iritis in the left eye, the sequelæ of which are, several strong posterior synechiæ which atropine and the continued specific constitutional treatment have not broken up (Fig. 1). The pupil is also covered by a film of deposit, much reducing vision and obscuring an ophthalmoscopic examination. The Passavant operations were as follows:

March 16, 1870—upwards and outwards.
" 22, 1870— " " on same synechia.
" 25, 1870—downwards and inwards.
" 29, 1870—downwards. Two were broken away.
April 2, 1870—upwards and inwards.
" 7, 1870—upwards.
" 15, 1870—upwards and out,

where the first two were done, as the iris seemed to be fastened down quite to its insertion, and the corneal opening was made far back, in order to be able to pull on the iris as near its periphery as possible. From this cut some blood flowed into the anterior chamber, obscuring a distinct view, and thus preventing a second application of the forceps. In two days the blood was gone, and the pupil round, under atropine. May 4, 1870, the patient was discharged from operative treatment, the pupil freely movable, but without atropine, varying a little from a circle up and out, where three attempts had been made to entirely remove attachment (Fig. 2). This synechia was broken *twice*, so far as the iris could be pulled. Whether the iris does not here contract from exudation in its tissue, or is fastened down, I cannot decide. I judge, however, the latter, as

the rest of it responds readily to light. The pupil now is much clearer and the fundus well seen with the ophthalmoscope. Vision of course correspondingly improved. No specific affection of the retina or choroid was noticed. The eye looks almost the same as the other, and is greatly improved in appearance. The three punctures of the cornea, so close together, have left a slight cicatrix, which will probably disappear, or if not, is of no consequence cosmetically. The spots of pigment now seen on the capsule show where the synechiæ were. There is no film over the pupil, and it is a question whether the breaking away of the synechiæ by removing the connection of the deposit on the capsule in the pupil from the iris did not hasten or facilitate its absorption. My own feeling was, that such a number of synechiæ and amount of lymph in the pupil would have ruined the eye, as I should have looked to the pupillary membrane becoming further organized.

M. N. C., a woman, æt. 38, has had severe specific iritis in both eyes, and, as sequelæ, a single synechiæ downwards in the left eye, whilst in the right there are several, some broader, others quite delicate, close together (Figs. 3 and 4). Continued atropine and constitutional treatment have failed to break these attachments, which do not show themselves in the right eye except under atropine. I did five Passavant's operations on the two eyes, as follows:

March 25, 1870—On the left eye downwards, clearing the pupillary edge completely;
On the right eye, April 19, 1870—downwards, two were broken;
" 22, 1870—up and inwards;
" 26, 1870—down and outwards.

Although I anticipated being obliged to perform at least four operations on this, the right eye, these three sufficed to free the iris completely, two synechiæ being broken away together by opening the forceps wide enough to embrace them at once. May 4, 1870, the effect of the atropine has disappeared. Both pupils are perfectly round and movable, responding to light and shade. The patient continues under constitutional treatment for other signs of syphilis. All the synechiæ in this case gave way readily and no blood entered the anterior chamber, as I did not have to pull the iris, except at its pupillary

edge, and so did not require my corneal cut to be where blood vessels would be touched by the lance-shaped knife.

E. B., a woman, æt. 25, has had severe specific iritis in the left eye, which, having run its course, has left a posterior synechia downwards that atropine and constitutional treatment do not break (Fig. 5). May 18, 1870, I broke this by Passavant's operation, and the pupil became round and movable. The patient continues under constitutional treatment for syphilis.

It will thus be noticed that the operations cleared the iris from the lens completely, leaving a round and movable pupil, except the single attachment in the first case.

Ether was given in all these operations, so I cannot say how painful it would be without.* Pain occurred subsequently in

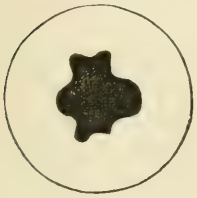

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

EXPLANATION.

Fig. 1. Pupil of left eye dilated by atropine, showing the attachments of the iris to the capsule of the lens. The film in the pupil is not shown.

Fig. 2. Shows the results of the operations. The pupil still drawn a little up and out.

Fig. 3. Right pupil dilated by atropine, showing the posterior synechiæ.

Fig. 4. Left pupil dilated by atropine, showing posterior synechiæ.

Fig. 5. Left pupil dilated by atropine, showing the posterior synechiæ.

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*Dr. Robert Amory, of Boston, reported to the "Society for the Promotion of Science in Medicine," the results of his experiments in reference to the use and purity of nitrous oxide gas. From the report, I feel inclined to employ

but one case, perhaps from the dragging of the iris or the presence of blood in the anterior chamber.

Outside of its very great necessity and importance to the ophthalmic surgeon, I think other physicians and surgeons will be interested to learn how the eye tolerates such operative interference. Seven operations on a single eye is a larger number than I at present know of having been done. My results certainly justified them. I need not dwell on the effect of attachments of the iris to the capsule; continued observation has shown that they are the fruitful source of recurrent iritis. We have always felt dissatisfied in seeing them left after iritis; now we have a safe and reliable means of breaking them away by grasping them with delicate forceps. I use a pair of moderately curved iris forceps, the teeth of which have been ground off, and the points serrated. The more delicate their spring, the less liable are we to pinch the iris too hard. Flowing off of the aqueous humor does not interfere, as the ends of the forceps are rounded, and can be pushed between the iris and cornea without danger. I have so far found this operation unexpectedly easy, and certainly most satisfactory in result. Iritis having just run its course would naturally seem to contra indicate interference, but experience has so far shown differently. Other cases now under my care will, I trust, also prove this to be true.

A Case of Supposed Glioma. Occurring in the Clinic of Dr. Erskine Mason, at the New York Eye and Ear Infirmary. Presented to the Society by Dr. Charles M. Allin, of New York.

W. V., æt. five months, was brought to me at the New York Eye and Ear Infirmary, May 28, 1870. The father, who is a clergyman and a man of science, stated that at birth the infant was very delicate and troubled with photophobia, and that he

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this as an anæsthetic in Passavant's operation whenever a favorable opportunity offers.

Since this is in press I have operated on one eye twice with ether, and on the same eye twice without ether. The patient disliked the ether, and much preferred to undergo the operation without. She did not complain of its being very painful.

noticed at that time a "yellowish reflection from the eyes, similar to what he had observed in the eyes of some birds." At the age of two months the child had "an attack of inflammation of the eyes," which resulted in an opacity of a portion of the cornea of the right eye. At the time of my seeing this patient, he appeared to be a remarkably healthy and well developed child. His complexion was fair, and irides light blue. Dentition began when he was fifteen weeks old, and at present he has two lower incisor teeth. The parents are both healthy, and there is no history of malignant disease in either family. The eyes are freely movable, but his vision evidently is either very limited or entirely lost. Upon examination the iris of the right eye is found pushed forwards and bound down by adhesion, pupil contracted, lens and cornea opaque. The iris of the left eye was slightly pushed forward, and there were some tags attached to it, evidently the result of an old iritis. From the fundus of the eye was seen a bright yellowish reflection, which could be observed at some distance. The iris dilated well under the use of a 2 gr. sol. of atropine. Upon ophthalmoscopic examination a tumor was observed of a yellowish hue, involving a portion of the retina, and some irregular vessels were distinctly seen coursing over the tumor, a few white nodules, I thought, could be detected on portions of the retina, and a portion of the fundus gave a normal reflection. The optic disc was not observed. This examination was made first while the child was under chloroform. The child was examined also by Drs. Carmalt, Allin, Curtis, Poor and Althof, and also by Dr. Derby, of Boston. All these gentlemen agreed with the diagnosis I had made (viz., that of glioma), nor was any doubt entertained as to the character of the trouble by any of the gentlemen. The nature of the disease (as we believed) was fully explained to the parents, and the only prospect of relief, they were told, would lie in the enucleation of both globes. This, after due consideration, they consented to, and on June 2d, in the presence of Drs. Carmalt, Poore and Curtis, I removed both globes. The eyes were at once placed in a preservative fluid, and put in the hands of Dr. Francis Delafield for further examination. Dr. Delafield reports as follows: "Both eyes were exactly alike. Cornea transparent;

iris in contact with cornea; lens pushed forwards against iris; retina detached and converted into a fibrous cord; choroid in place, many of its epithelial cells hypertrophied. The space between the choroid and detached retina was filled with a thick reddish fluid, and a firm brownish mass, composed of shrivelled blood globules and granular matter. The outside of this firm mass has many cells resembling choroidal epithelium adhering to it."

Rough Notes of a Case of Glio-sarcoma. By B. Joy Jeffries, Boston.

O. P., a healthy bright-looking man, æt. 27, had, in the summer of 1869, *i. e.*, from May onward, occasional swelling of the lids of the right eye, passing off rapidly and without pain. Sept. 9, 1869, during the hurricane, he was exposed to wet and wind on the beach at Swampscott watching the wrecks of vessels ashore. Following this immediately was great pain and inflammation in the right eye, for which he was under a doctor's care some five or six weeks. His sight was gone in two or three weeks after the exposure. The pain subsided, and has since recurred only when he has had attacks of "*cold in his eye*." The left eye remained perfect. May 24, 1870, the patient presented himself with a largely dilated pupil and a general glaucomatous look to the eye. A yellowish looking tumor, which raised the upper lid but did not prevent motion of the globe, was seen in the position of the attachment of the superior rectus muscle. There was not much injection either ciliary or conjunctival. The patient states that there has been increased pain the last three weeks, during which time the tumor has appeared and grown. The growth was diagnosticated as sarcoma, or glio-sarcoma, and enucleation proposed in hopes the whole might be removed and the optic nerve not affected. The amount of pain present, and a desire for removal of the now unsightly eyeball, induced the patient to submit to enucleation. About two-thirds of the superior and one-half the external rectus muscle were cut away with the globe. Examination showed the optic nerve enlarged two or three times and of a dirty gray color. The tumor consisted of the sup. rect. muscle enlarged with the growth. The choroid was firm all

round, 2‴ thick, in spots lighter in color. The retina adherent but not thickened apparently. The sclerotic on section through the affected muscles thinned, and showing where the disease had passed through it. The whole of the ciliary body, *i. e.*, muscle and processes, equally affected with the disease. Less pigment than natural in these and the whole choroid. Microscopic examination of a section of the optic nerve showed only the *rounded* typical cells of glioma, none oval or spindle-shaped. In the recti muscles there were principally rounded glioma cells, but some oval. In the choroid mostly spindle cells, but here also all the shapes from this through oval to round cells, with one or two nuclei. The whole appearance closely resembled cases in Prof. Knapp's "Intra-ocular Tumors." It was difficult to say where the disease started from. It worked through the sclerotic near the attachment of the recti muscles.

Tumors of the Retina. By Dr. Francis Delafield, of New York.

Although a considerable number of cases of retinal tumors have been published during the last few years, and although most of these tumors have been well and accurately observed, all their characters cannot be considered as settled.

It is, however, generally agreed at the present day that the primary tumors of the retina all belong to one class, and the name "glioma," proposed for this class by Virchow, has been adopted by most authors.

Although, however, all are agreed that these tumors originate in the retina, there is considerable confusion as to the exact point at which they begin, as well as to the relationship between the elements of the tumors and those of the retina.

Schweigger considers the elements of the tumor as identical with the layers of granules of the retina, and considers both to be of the nature of connective tissue. He supposed that the tumor originated in the layer of inner granules and grew outwards.

Robin describes these tumors under the name of "Tumeurs à Myélocytes," and considers them as a hypergenesis of the granules of the retina. In one of his cases the tumor grew inwards, the vacillary layer being preserved unaltered.

Horner and Rindfleisch describe a case, in which the disease was far advanced, as an example of medullary sarcoma.

Virchow says that the tumor arises in the outer layers of the retina and grows outwards; that it consists in a hyperplasia of the connective tissue elements of the retina; that the retina may be the seat of pure glioma, or of glio-sarcoma, or sarcoma, or of combination forms of glioma and sarcoma. Furthermore, that there is no sharp line of distinction between glioma and inflammatory new growths of the retina.

N. Manfredi describes a case in which the new growth began at the inner surface of the limitans interna, perhaps from the nuclei at the base of the radial fibres described by Kölliker.

Knapp says that the elements of the tumor are cells, having a large nucleus surrounded by scanty protoplasma, and resembling lymph corpuscles. That these cells are formed by a simple hypergenesis of the elements of the layer of outer granules, and that the tumor grows outwards.

Hirschberg, who has described one of the best cases for studying the development of these tumors, says: that the new growth begins in the layer of inner granules; that it is produced from the connective tissue elements of that layer; that the elements of the tumor resemble the granules of the retina, and that the tumor grows outwards.

Iwanoff describes a case in which the new growth had its origin in the connective tissue cells situated in the layer of nerve fibres, and grew inwards. He also draws attention to the careless way in which the elements of these tumors, and the elements of the layers of granules have been described as if they were identical. The layer of outer granules are said by Schulze to consist entirely of cells connected with the rods and cones. The cone granules are intimately connected with the cones. "The rod granules consist of a globular, homogeneous nucleus with small shining nucleoli and an extremely thin cortex of a hardly granular, but dusty troubled cell substance, which is distinctly visible only at the upper and lower ends of the nucleus, and from which fine fibres are given off. Henle, Schulze and Ritter also describe a peculiar striation of the rod granules. The elements of the tumor are certainly not the same as these.

It will be seen, therefore, that the tendency is to give the name of glioma, proposed by Virchow for only some retinal tumors, to all retinal tumors.

All the observers, except Iwanoff, Manfredi and Robin, describe these tumors as growing outwards towards the choroid.

All, excepting Iwanoff, Manfredi, Rindfleisch and Hirschberg, seem to consider the elements of these tumors to be a hypergenesis of the granules of the retina. These authors, on the other hand, regard the connective tissue elements of the retina as the matrix.

Hirschberg places the origin of the tumor in the inner granules; Knapp, in the outer granules; Manfredi and Iwanoff, in the layer of nerve fibres.

All give the same general description of the elements of the tumor: cells having a large round nucleus, surrounded by scanty protoplasm and measuring about .009 mm. The cells imbedded in a finely granulated substance. In the secondary choroidal and episcleral tumors the cell bodies are larger, and there is a well-defined fibrous stroma.

The original retinal tumors are soon followed by secondary new growths. The choroid, especially that part surrounding the optic nerve; the optic nerve; the sheath of the optic nerve; the episcleral connective tissue; the brain; the cranial bones; the pericranium, dura mater and diploe; the spinal cord; the lymphatic glands and the liver, may all become the seats of secondary tumors.

The choroid is the first seat of the secondary tumors.

According to Knapp, this takes place in two ways: by direct contact, and by scattered cells. In the large flat tumors which grow beneath the choroid around the nerve, there is a continuous new growth from the retinal tumor to the choroid. In the smaller tumors which occur in other parts of the choroid, he says that the cells from the tumor fall upon the epithelium, proliferate, form little nodules between the epithelium and basement membrane, and lift up and break through the epithelium inwards or the basement membrane outwards.

As a rule, although with some exceptions, the optic nerve is the next tissue attached by the new growth.

According to Knapp, the glioma cells press themselves into

the spaces between the nerve fibres, which are filled with connective tissue and vessels and increase there. Later the nerve fibres are also destroyed.

The episcleral tumors may reach a great size.

According to Knapp, the glioma cells excite inflammation and softening of the sclera. The cells of the intra-ocular tumor press themselves into this softened tissue, and when they have reached the outside of the sclera proliferate. He gives a plate of a small clump of cells penetrating a short distance into the sclera, but no plate of any continuous growth between the intra and extra-ocular growths.

Hirschberg also describes small clumps of cells in the sclera, but was unable to see any continuous communication between the extra and intra-scleral tumors.

In some cases the tumor bursts through the sclera by its pressure and forms a fungous, protruding mass.

The prognosis of these tumors is unfavorable.

When they are not removed by operation, the patient usually dies within a period varying from a few months to two years. There is no satisfactory case of spontaneous cure, although there are several cases of temporary atrophy of the globe, and one case by Sichel of possible cure.

In most cases where the tumor is removed the disease recurs in a few weeks, and death follows after a few weeks more.

There are, however, a few cases of cure after operation.

1. Panizza. A case where the disease was entirely confined to the retina, and there was no recurrence in six years.

2. Carter. A case of the same character; no recurrence in six years.

3. Manfredi. A case in which there were small secondary tumors of the choroid, but none of the nerve. No recurrence within one year.

4. Hirschberg. A case in which the disease was confined to the retina. No recurrence in fifteen months.

5. Hirschberg. A case in which the disease had attacked the choroid and optic nerve for $1\frac{1}{2}$ mm. A second portion of nerve 3‴ long was also removed but not examined. No recurrence in one year.

Case I. The eye was removed by Dr. H. D. Noyes, Feb. 19,

1869. It was taken from a girl 18 months old. Her father had noticed a white spot in the pupil of this eye three months before its removal. There was no recurrence up to April 16th.

The eye was opened by a horizontal section immediately after its extirpation. The cornea, iris and lens preserved their normal appearance and relative position.

The cavity of the globe, posterior to the lens, was filled with a soft, whitish mass, stained red in some places by hemorrhages, and so soft as to be semi-fluid. The elements of this mass, examined fresh and without the addition of any fluid (Hartnack 9 immers.), were round cells, of very pale, finely granular appearance, exhibiting no nucleus until iodized serum was added, and measuring .0116 mm. They did not resemble the granules of the retina examined in the same way.

After hardening the eye in Müller's fluid, the tumor was seen to be continuous with the retina over about half its surface, and in close apposition with it over the other half, the optic disc being only covered by the tumor. Sections were then made of the tumor and retina in many different directions.

The retina, where it is only in apposition with the tumor, appears well preserved, its layers have their normal relations, except that the limitans interna and radiating fibres are thickened. In some sections small portions of the tumor remain adherent to the limitans interna. When sections are made of that portion of the retina, which is continuous with the tumor, it may be seen that in some sections only the rods and cones and limitans externa are left, the tumor replacing all the other layers. In other sections the rods and cones, limitans externa, outer granules and outer inter-granular layer are all distinct and unaltered. At the line where the tumor ceases to be continuous with the retina the growth of the tumor is seen to take place in two ways. First, as we follow the layers of the retina towards the tumor, we see round cells making their appearance in the layer of nerve fibres, and a little farther on in the layer of inner granules, the internal inter-granular layer remaining intact. These cells increase very rapidly in number, rendering the layers in which they occur much broader, pushing the limitans interna inwards, pushing the external inter-granular layer outwards, the cells in the two layers coming in

contact with each other, until there is one continuous mass of cells extending from the limitans externa inwards.

Second, we see the round cells making their appearance in the same layers, and increasing in the same way, but the limitans interna, instead of being pushed inwards and then disappearing in the tumor, is pushed inwards and then turned over outwards against the adjoining portion of limitans.

The choroid and optic nerve present no traces of new cell growth.

In this case, therefore, the tumor, as in Iwanoff's case, grows inwards. The rods and cones and limitans externa are not invaded. The outer granules and outer inter-granular layer are also in great part not involved. The internal portion of the retina from the outer inter-granular layer inwards is the principal seat of the new growth.

The elements of the tumor are not identical with the retinal granules, but with the cells which we find in many new growths, inflammatory and permanent.

The new growth being confined to the retina, the enucleation was a complete removal of the disease. Two months afterwards there was no recurrence, but since that time the patient has not returned.

Case II. The eye was removed May 22, 1869, by Dr. C. R. Agnew, from a child 4 years old. The eye was first noticed by the parents to present an abnormal appearance two years before its extirpation. During the last six months there was a great deal of pain in the eye, and the child's general condition became very bad. The child died within a year after the enucleation.

The eye was hardened in Müller's fluid. The cornea was transparent. The lens was pushed forward, partly through the dilated pupil, into the anterior chamber.

The cavity of the globe was filled with a soft, whitish and reddish colored mass, which was continuous with the optic nerve. Around the optic nerve the choroid was lifted up by a tumor of considerable thickness, and at the equator by another thinner tumor.

The soft tumor, which fills the globe and is continuous with the nerve, evidently has its seat in the retina, leaving, however,

no traces of the normal retinal tissue. The anterior portions of this tumor are composed of small, round cells. The portion of the tumor near the optic nerve consists of larger cells, having a distinct rounded or polygonal cell body with a large round nucleus; these cells are imbedded in a stroma of reticulated connective tissue.

The choroid, besides the large tumors on the outer aspect, is everywhere altered. The retinal tumor comes in contact with its entire internal surface, but does not adhere to it. When sections of the choroid are made, it exhibits various stages of alteration. In some places the stroma is thick and fibrous, the epithelial layer is thickened, the individual epithelial cells in some instances enormously hypertrophied; between the epithelium and basement membrane are round cells, either collected in little heaps, lifting up the epithelium, and in some places breaking through it, or forming a uniform, thin layer. In some places are small elevations, formed entirely of pigmented cells. In other places the same changes in the epithelium exist, but the stroma is infiltrated with round cells; the basement membrane, however, remains intact between the sub-epithelial new cells and those in the stroma. In the large tumors around the optic nerve and at the equator, the cells are large, the cell bodies and nuclei both distinct and imbedded in a reticulated stroma. The new growth is in contact with the outer surface of the basement membrane, but does not break through it; the epithelium on the internal surface of the basement membrane presents the same changes as already described. Although the choroidal tumors around the optic nerve are in very close contact with the retinal tumor, yet, with sufficiently high magnifying powers, a line of demarcation between them can always be distinctly perceived.

The optic nerve was cut off close to the globe. It is infiltrated with round cells.

In this case portions of the retinal tumor are composed of the same cellular elements as in the first case. Other parts of the retinal tumor as well as the choroidal tumors are made up of cells, having a larger cell body and imbedded in a distinct stroma. Whereas the smaller cells are not contained in a stroma, but in a finely granular substance.

The little clumps of cells beneath the choroidal epithelium, described by Knapp, are numerous, but in no case do they break through the basement membrane. They occur also over the large tumors of the choroid. There are also thinner, more diffused layers of cells between the epithelium and basement membrane. The choroidal epithelium is everywhere altered, the cells increased in size and number.

The large choroidal tumors around the nerve, although apparently continuous with the retinal tumor, can, with high powers, be seen to be separated from it by a thin layer of choroidal tissue. The greatest thickness of these tumors is not next to the nerve, but at a little distance from it.

Case III. The eye was removed by Dr. Carmalt from a girl 4 years old. Ten months before its removal the eye became red and painful, and soon after the pupil gave a green reflex. Six months before its removal there could be seen with the ophthalmoscope a tumor, the size of a pea, in the outer portion of the fundus. Within four months after the removal of the eye a tumor appeared in the orbit, and a few months later the child died. A tumor was found in the brain at the optic chiasm.

The cornea, iris and lens are unchanged. The anterior chamber is filled with fibrine. There is an episcleral tumor extending from the optic nerve to just in front of the equator.

The cavity of the globe is nearly filled with a soft white tumor, continuous with the optic nerve. This tumor has the usual structure of small round cells. No retina can be seen.

Around the nerve the choroid is lifted up by flat tumors, extending on one side as far forward as the ciliary body. The choroid presents the same minute changes as were described in the last case. The tumors around the nerve are in this case, also, distinctly separated from the retinal tumor.

The optic nerve was cut off at a distance of 23 mm. from the sclera. It is slightly increased in size. Throughout this entire length the nerve fibres have disappeared and are replaced by round cells. The fibrous septa between the bundles of nerve fibres preserve nearly their normal arrangement, although in some places they contain cells. The inner sheath of the nerve is thickened, and contains small, oval cells, the

outer sheath also contains small oval cells in its inner layers. There are no cells between the two sheaths.

The episcleral tumor has the same structure as the intra-ocular growths, except that the connective tissue is more abundant. There are several small infiltrations of cells in the sclera between the choroidal and episcleral tumors, but there is nowhere any regular cell communication between the intra and extra-ocular growths.

In this case the same discontinuous character of the choroidal from the retinal tumor exists. The episcleral tumor, also, has no connection with the intra-ocular growths, although there are small infiltrations of cells in the sclera between them. In the optic nerve the tumor has replaced the nerve fibres, the fibrous sheath and septa being only slightly involved.

Case IV. The eye was removed by Dr. Roosa from a male child two years old. An opacity in the pupil of this eye was first noticed one year before its removal. Within four months the vision of this eye was destroyed, and the eyeball went on to protrude slowly. A tumor connected with the eye, and situated in the upper and outer portion of the orbit, was removed at the same time with the eye.

One month after the extirpation of the eye, the tumor reappeared in the orbit. Soon after this the sight of the other eye was lost; there was hemiplegia of the left side, with other evidences of disease of the brain.

The orbital tumor is the size of a pigeon's egg, is of irregular ovoid shape, and has its attachment on the sclera, to the upper and outer side of the optic nerve.

The eyeball measures 30 mm. in its antero posterior diameter; between the tips of the ciliary processes 12 mm. There is an annular staphyloma over more than half the circumference of the globe, in the sclera between the corneal insertion of the iris and the ciliary body. The iris is carried forward with the cornea so as to form a nearly normal anterior chamber.

In the cornea are several opacities formed by the change of the corneal tissue into granular matter.

The lens is transparent; it is held in place by the suspensory ligament, which is lengthened, thickened, and of a white color.

The anterior surface of the lens is 2 mm. posterior to the plane of the iris.

There is a tumor continuous with the optic nerve and extending forwards; just before it reaches the lens it separates into a thin membrane, which is attached at the ora serrata. It is not in contact with the choroid, except at the situation of the choroidal tumor. The tumor is composed of the usual round cells. The membrane is composed of fibrous tissue, the fibres preserving a resemblance to the radial fibres of the retina.

Beneath the retinal tumor, reaching from the nerve to the equator, is a tumor growing from the outer layers of the choroid. Over nearly the entire internal surface of the choroid is a thin layer of round cells. Here and there the epithelium is lifted up by little groups of round cells.

The optic nerve is cut close to the sclera; the nerve fibres are replaced by round cells.

The attachment of the episcleral tumor is directly over the choroidal growth. The sclera between the two is thinned, and in some places infiltrated with round cells; but neither the retinal, choroidal or episcleral tumors are, in any proper sense of the word, continuous with each other.

Case V. The eye was removed by Dr. Mason from a girl $2\frac{1}{2}$ years old. Six months before the operation it was first noticed that the pupil of the right eye was enlarged. This was soon followed by pain in the eye, and afterwards by exophthalmos. After the removal of the eye the orbit was scraped and washed with ac. acetic. Six weeks after the operation a tumor appeared in the orbit. Soon after tumors appeared over both temples and on the inferior maxilla, the vision of the other eye was lost, and the child died three months after the operation.

The anterior two-thirds of the globe has its normal shape; the posterior third is continuous with an irregular mass, composed of muscles, connective tissue and a small tumor. The cornea is opaque; the iris cannot be seen; the lens is pushed forwards against the cornea.

The cavity of the globe is filled with a tumor soft and white at its centre, firm and gray at its periphery.

The choroid and retina cannot be distinguished.

The sclera is unaltered over the anterior two-thirds of the globe; over the posterior third it is lost in the tumor.

The central soft portion of the tumor is composed principally of round cells; the peripheric portion contains, in addition, a distinct network of connective tissue. Where the tumor has replaced the sclera, it can be seen that the latter has not disappeared, but has been split up into layers of fibrous tissue. This shows the same method of propagation of the new growth as in the previous cases—that is, by the formation of new foci at a little distance from the parent growth, and not by a continuous invasion and replacement of the neighboring soft parts.

The optic nerve is imbedded in the tumor. There are groups of round cells between its two sheaths and replacing its nerve fibres.

The extra-ocular tumor is continuous with the posterior portion of the globe. It is surrounded by thickened connective tissue and by the muscles attached to the globe. The muscles present no change.

In these three cases it is noticeable that in the optic nerve the cell growth replaces the nerve fibres, instead of the fibrous septa between them.

The conclusions which I would draw from these cases are:

1. The elements of these tumors, when not changed by preservative fluids, do not correspond to the normal elements of the retina, but to those of *connective tissue cellular new growths.

2. That these new growths having the character of permanent new growths, the shape and arrangement of their elements correspond exactly to those of the round celled, medullary sarcomata of other regions.

3. That secondary tumors are formed, as described by Virchow for the sarcomata, in three ways.

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*According to Schulze, the outer granules are all connected with the rods and cones, have the shapes already described, and are not mingled with any other nuclei or cells. The inner layer of granules consists of fibres in which are imbedded nuclei and of the granules proper, which Schulze ranks with the nervous elements. Henle describes the inner granules as of two kinds: (1.) Globular, transparent nuclei, measuring .005 mm. (2.) The same nuclei enclosed by a small cell body.

(*a*) By continuous infection, usually of the entire retina and optic nerve.

(*b*) By discontinuous infection, forming the subchoroidal and episcleral tumors.

(*c*) By metastasis proper, forming tumors in the brain, bones, glands and liver.

4. That these tumors have precisely the clinical history of sarcomata. The prognosis becoming more favorable in proportion to the early stage at which the tumor is extirpated.

5. Virchow's definition of sarcoma is: "I understand, under this name, a tumor of which the tissue has the general characteristics belonging to the connective tissue group, and which differs from the well defined species of the connective tissue group only in the disproportionately increased number of the cellular elements." In another place he says: "That he regards the interstitial connective tissue of the retina as a parallel tissue to the neuroglia, and that from this tissue are developed the gliomata of the retina."

Here, then, is a tumor developed from a species of the connective tissue group—the neuroglia, and which differs from this species only in the disproportionately increased number of its cellular elements. Why is not such a tumor to be classed as a sarcoma, with the special name of glio-sarcoma?

A Case of Retinal Glioma Operated on at a very early period, and showing some New and Peculiar Anatomical Conditions. By Dr. H. Knapp, of New York.

A healthy looking boy was brought to me, nine months ago, on account of blindness and inflammation of his left eye. The blindness had been noticed a year previously, together with a yellowish lustre of the pupils. Dr. H. D. Noyes, whom the parents consulted six months later, pronounced it to be a malignant growth, and advised the removal of the eye. Alarmed by this statement, and more pleased with other more favorable opinions, they neglected to see Dr. Noyes again, not doing anything for the eye, which remained blind, but did not annoy or disfigure the patient, until an exposure brought about a painful ophthalmia. A week later I saw the boy. His eye was hard

and red, the pupil wide and immovable, behind the lens a dull yellowish mass. I expressed the same opinion as Dr. Noyes, of which, by the way, they had informed me only after I had enucleated the globe. The child recovered in a few days, and has been, up to this day, perfectly well.

In opening the globe by a meridional section, beginning in the centre of the cornea, the lens separated from the ciliary body and fell into the dissolved vitreous. The retina was detached in its whole extent, like a funnel which was united, with its small extremity to the optic disc, as usual; its broad end, however, was not adherent to the choroid at the ora serrata, but connected with the crystalline body. Immediately behind the lens the retina enclosed, or was metamorphosed into, a soft yellowish tumor the size of a small hazel-nut. The posterior portion of the detached retina was folded and studded with a few miliary swellings, which, on microscopic examination, manifested themselves as small glioma tumors, growing out of an entirely degenerated retina, so that their starting points could not be traced to a particular stratum of the retina.

The minute examination of the tumor behind the lens showed that the pseudoplasm was, to its greatest extent, enveloped by the *detached and wrinkled retina and its pars ciliaris*, which was in connection with the equatorial edge of the crystalline. The surface of the tumor was smooth throughout, but somewhat wrinkled and nodular. The tumor could be raised from the enveloping retina, except at a small area in which it was blended with it. In all the other places the surface of the tumor consisted of the *inner* retinal layers. The limitans interna, the fibrous and ganglionic layers were well preserved in most places, the molecular layer had disappeared, both the granular layers were blended, no intergranular layer being visible. The granular layers were thickened by increase of the radiating connective tissue fibres. Coalescent clusters of small round cells (glioma) lay in the inner granular layer, and extended through the outer granular layer and outer limitans into the vitreous space, generating the bulk of the tumor. In some places there was also a proliferation of small round cells starting from the outer border of the outer granular layer, and in other places the small cells crowded in the inner retinal

layers, destroyed the nervous elements, and extended through the ruptured internal limitans on the inner side of the retina. Both the last named sources of newly formed cells were, however, limited, producing no compact masses of pseudoplasm.

From the results of the examination, the following conclusions with regard to the development of the glioma may be derived. The new growth started in isolated clusters from the inner granular layer, invading subsequently the outer granular layer, and the inner strata of the retina At the same time inflammatory action was present in the retina, which, being of a plastic character (increase of connective tissue), rendered the adhesion between retina and choroid somewhat firmer than usual. The new growth developing within the granular layers of the retina, therefore, found a greater resistance on the part of the choroid and sclerotic, than on that of the inner retinal layers and the vitreous. The inner layers of the retina were stretched and pushed inward as the tumor increased in the outer layers. The growing pseudoplasm produced at first a partial detachment and doubling up of the retina, after which the whole retina became separated from the choroid, as is usual during the development of intra-ocular tumors in general. The seat of the tumor was in the anterior portion of the retina, near the ora serrata. The tumor, in its growth, exerted an immediate traction also on the pars ciliaris retinæ, detaching it from the ciliary body. It protruded into the vitreous, being, as it were, invaginated into the retina, so that, when the retina became totally detached, it enveloped the tumor like an external coat.

Apparent Form of Inverted Ophthalmoscopic Image of Optic Disc in Astigmatism. By Dr. G. Hay, of Boston.

It was formerly stated that this image is more magnified in the direction of the meridian of least refraction. This is true only for certain positions of the so-called objective ophthalmoscopic lens. For instance, it is the case if this lens is quite near to the eye, at a distance, by approximative calculation, less than its own focal distance.

If the objective image is far removed from the eye, we may

get an inverted image similar to that of the upright. Supposing the disc really circular, and the objective lens to be at a distance from the eye, greater (within certain limits) than the length of its own focal distance, the inverted image would appear oval with the long axis in the direction of the strongest meridian, just as is the case with the upright image.

When the objective lens is nearer, about at its own focal distance in front of the eye, the apparent form of the inverted image would be nearly round.

These changes in the apparent form of the inverted image, according to different distances of the objective lens from the eye, may be illustrated by a combination of glass lenses, as in the apparatus shown.

The relations involved may be expressed in formula [1] below, the method of deducing which is indicated in the following:

If we represent by R_s the diameter or breadth of the disc in the direction of the strongest meridian, and consider this diameter as an object of which an image is formed by the strongest meridian of the eye; and if we consider this latter image as an object of which another image is formed in front of the eye by the objective lens, and call this last image I_s; and if R_w and I_w have corresponding significations for the weakest meridian; and further, if

S represents the distance of upright virtual image of R_s behind ant. nodal point, and this image being considered as formed by the strongest merid. of the eye,

W " similarly for the weakest merid. of the eye,

f " the focal distance of the objective lens, and

d " the distance of this lens from ant. nodal point of the eye,

we then obtain for hypermetropic astigmatism by means of elementary optical formulæ,

$$\frac{I_s}{I_w} = \frac{S}{W} \times \frac{W+d-f}{S+d-f} \qquad [1]$$

From this it is manifest if $d=f$, then $I_s=I_w$, that is, the image will be of the same size in the two principal directions.

In hypermetropic astigmatism W is less than S, and each is positive. Then if $d < f$ and $W > f-d$, we have $I_s < I_w$. If $d > f$, then $I_s > I_w$, as in the upright image.

Formula [1] would hold also for myopic and mixed astigmatism. In case, however, either principal meridian were myopic, the corresponding S or W would be negative, and would refer to the inverted image in front of the eye of the corresponding magnitude, R_s or R_w, the image being considered as formed by the respective strongest or weakest meridian of the eye.

To facilitate the interpretation of the formula [1] in such case, we might put $S = -S'$, or $W = -W'$, or both; S' and W' being each positive. Then similar relations, within certain limits, as those above for hypermetropic astigmatism, could be deduced for myopic or mixed astigmatism.

It should be mentioned that an elaborate article upon this subject, by Giraud-Teulon, may be found in the Annales d' Oculistique for September and October, 1869.

A Peculiar Case of Conjunctival and Corneal Inflammation. By D. B. St. John Roosa, M. D.

I beg to submit to the consideration of the Society a case of conjunctival and corneal inflammation, which seems to me to present some peculiarities distinguishing it from the ordinary forms of herpes of the conjunctiva and cornea, or phlyctenular conjunctivitis and keratitis, to which it is closely allied, or, perhaps, with which it is identical.

The case has caused me no little embarrassment in diagnosis and treatment, and I may add it has been pronounced a very rare one by two members of this Society, who have seen the case in consultation.

On the 20th of September, 1869, I was consulted by Miss X., æt. 18, at the instance of her father, a well-known physician of New York, in regard to a redness of the right eye, which had appeared the day before. I found, on examination, that the eyelid drooped to such an extent as to about half cover the pupil. On making an effort the lid could be lifted to some extent, but not thoroughly. This drooping was not the characteristic clinched closing of photophobia, but it resembled true ptosis. The ocular conjunctiva at the inner side was intensely reddened, the redness increasing at the limbus, so that

the vessels passed upon the edge of the cornea. The whole ocular conjunctiva was also slightly reddened. There were no phlyctenulæ on the conjunctiva or cornea. The palpebral conjunctiva was healthy. The pupil was contracted, the movements of the iris sluggish. There was some lachrymation on exposure to light. The fundus was healthy. Refraction, H 1-36. There was some tenderness of the upper portion of the globe.

The patient was a blonde, in very fair general health; perhaps the nutrition was not up to the normal standard. In earlier years she had suffered from phlyctenulæ of the cornea, and in the upper portion of the corneo-sclerotical junction are two minute white dots, supposed to be cicatrices of these phlyctenulæ, as is also a very narrow white line on the nasal side. The patient had considerable pain referred to the eyeball. The other eye was absolutely well. The father stated that one or two similar, though less severe, attacks had occurred within the past four weeks, and that the lid had drooped for some weeks previously.

The inflammation was supposed to be of the herpetic or phlyctenular variety, although no vesicles could be detected. There was no alteration in the structure of the cornea. It was treated by instillation of atropine and the use of cold water compresses. The acute pain and intense redness passed off in a few hours, and the other symptoms, so that the eye looked very well in about forty-eight hours, although the lid still drooped.

In one week after this attack I was again summoned to see Miss X. I found her suffering from precisely the symptoms as those detailed above. The same treatment was pursued, and the same result followed. A third attack occurred in the third week, and until June 28 they continued to recur weekly, but, in the last two months, with not quite the same regularity as at first; when, for some months, the patient was able to tell on what day her eye would become red.

The patient had never suffered from any malarial affection. She had spent two weeks in the past summer in a decidedly malarious district, and during one of the early attacks she had what she thought was a chill. On the recurrence of the third

attack I instituted an anti-malarial treatment, by means of quinine and iron, but without avail. She also took a trip to Florida, and was absent about four weeks, but the eye became inflamed as usual, and, on one occasion, when no atropine was used, the pain was much severer than usual, and lasted much longer.

Dr. Alonzo Clark saw the patient in the Spring and advised the use of chinoidin with the quinine and iron. This was of no avail. Fowler's solution was prescribed by myself before this, but its use caused gastric disturbance, and it was desisted from. Astringents proved of no avail, but the atropine always alleviated the symptoms.

I then, after some six months' experience with the case, without seeing any improvement to the eye, although the general nutrition was better, asked that Drs. Agnew and Loring might see it with me, which they did, both during the attacks and in the intervals. At their suggestion quinine was again used, at regular intervals, beginning twenty-four hours before the attack. Nitrate of silver in solution was applied, calomel was dusted in, but all without effect. These gentlemen confirmed what I have said, except that they thought that there was some change going on in the corneal tissue during the attacks, although not well marked or decided; and this they did not observe until they had watched an attack, in which hot water applications had been freely made.

Hot applications were used during two attacks, and I am informed that during an attack which occurred while I was out of town, the changes in the cornea were more marked. At the next seizure there were none, and I have never seen any change in the cornea when the inflammation was progressing, except the approach of the blood-vessels to the margin.

Since June 28 the patient has been at Narragansett, and but one flush has occurred, and I am told the eye now opens well and is free from all disturbing symptoms.* The left eye has remained absolutely healthy during the whole time, and Dr. Loring ascertained that the attack of pain and redness was always preceded by sneezing, confined to the affected side.

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* Nov. 28, the eye continues well.

The peculiarities of this case seem to me:

1. The periodicity. The patient was usually able to tell the day when an attack would begin.

2. The long existence of such an inflammation on the corneal margin, with no marked changes in its structure, or the appearance of phlyctenulæ on the conjunctiva.

3. The persistent drooping of the lid when the eye had cleared up.

4. The obstinate resistance to local and constitutional treatment, although the general condition seemed very good.

5. The absolutely healthy condition of the left eye throughout the whole course of the disease of the right.

I have been unable to find that it agrees with the descriptions of herpes of the cornea or conjunctiva, or with the so-called keratitis marginalis; and although I am not now willing to classify it with the cases of intermittent ophthalmia, from malarial influence, as I was at one time disposed to do, and on which ground the case was criticized at a meeting of the New York Ophthalmological Society, I still think that the symptoms which I have attempted to delineate entitle the case to be considered a peculiar one.

Canthoplasty in the Treatment of Diphtheritic Conjunctivitis. By Charles M. Allin, M. D., of New York.

The severity and rapid destructiveness of this disease, and the great difficulty often encountered in obtaining a satisfactory view of the conjunctiva and cornea, are well recognized, and the division of the outer canthus to effect this object I am aware is not new. But the operation of "canthoplasty" (using the term in its present accepted sense), in the most acute stage of the disease, I believe was for the first time performed in the case which I now relate.

The advantages which it possesses over the simple division of the commissure are these. By the latter procedure we do, it is true, effect a temporary relief from the extreme pressure of the swollen lids, and can, for the moment, see the condition of the cornea and recognize the extent of the diphtheritic exudation; but, if left to itself, as it heretofore has been, the wound

will either almost immediately heal, and the pressure therefore be as great as before, or else the freshly exposed surface will be covered by diphtheritic deposit, and the case become even more formidable than at first. By the former operation we not only obtain all the benefit of the relaxed pressure, but we also secure a *permanent* enlargement of the palpebral fissure, thus enabling us to gain *repeated* access to the entire mucous membrane, both for observation and treatment, throughout the continuance of the disease. And, in addition, we are able to anticipate with more certainty a satisfactory appearance of the commissure when the recovery is complete.

Clara H. Hauser, born in Germany, 23 years of age, was admitted to the New York Eye and Ear Infirmary on the evening of the 30th of August, 1869. The lids of both eyes were enormously swollen, very hot, and tender to the touch, so that it was impossible to separate them sufficiently to obtain even the slightest view of the cornea. At every attempt to separate them there was a gush of hot tears, with which were mingled yellowish flaky masses, so characteristic of diphtheritic disease. This condition had already continued two days, there having been considerable conjunctival redness for nearly a week previous.

Ice compresses were immediately applied, and continued incessantly throughout the night, but without much apparent effect. I therefore, at 1 P. M. on the 31st, divided the outer canthi freely, and by so doing was enabled to evert the lids, though still with considerable difficulty, as they were very hard and stiff, owing to the gelatinous infiltration of the subconjunctival tissue. I however succeeded in obtaining a full view of the entire conjunctival surface, as well as of a small portion of the cornea not overlapped by the chemosis. In the left eye the cornea showed extensive infiltration of a pale yellowish color, and in the right the same condition existed, with an ulceration and apparently a perforation at the lower margin. This latter, however, afterward proved to be only apparent. Patches of diphtheritic membrane covered nearly the entire conjunctiva, though surfaces from which membrane had evidently been detached were here and there visible. To these surfaces solid nitrate of silver was very carefully applied. I

now proceeded, as in the usual operation of "canthoplasty," to unite the conjunctiva to the skin by introducing in each wound three sutures, one in the centre of the incision, and one each above and below.

At my next visit I found it even more easy to separate the lids than immediately after the operation, the swelling was decidedly diminished, and from this time, with the continuance of the ice compresses and the occasional application of the nitrate of silver, constant improvement followed. The infiltration gradually, but entirely, disappeared from both corneæ as the chemosis subsided, and both eyes were saved. If the operation had not been performed, and without further delay, it cannot be doubted that sloughing of both corneæ must have occurred.

Note.—Sept. 27th, 1870. Dr. Althof informs me that since my case occurred, *he* has treated five cases of diphtheritic conjunctivitis by the method here described, and with uniform success.

42 West 36th St.

An Additional Method to Determine the Degree of Ametropia. By Wm. Thomson, M. D. With a wood-cut.

In the American Journal of the Medical Sciences for January, 1870, will be found a description of a test for ametropia, based on the experiment of Scheiner. It was there shown that whenever the visual axis is too long or too short, a point of light, used as a test object, will appear double to the eye of an observer when it is examined through two small perforations in an opaque screen.

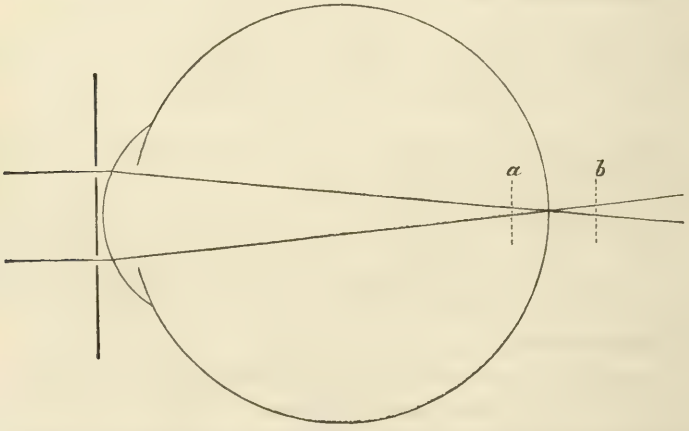
A short experience with the disk clinically, or with ametropia artificially produced, convinces one that the degree of ametropia influences the apparent distance apart of the double lights, and that if that distance could be computed with accuracy, the degree of ametropia could be diagnosticated, and a correcting lens selected without a prolonged empirical examination.

After a sufficiently full demonstration of the laws of refraction as applied to the human eye, and an exhaustive analysis of its refracting surfaces of different curvature and its media of

varied density, Donders gives his authority, in addition to that of Helmholtz, for the adoption, for purposes of calculation, of the simplified diagrammatic eye of Listing, which consists, as is well known, of a single refracting surface of 5 mm. radius in curvature, and a medium whose index of refraction is 1.333, whose posterior focus is 20 mm., and its anterior focus 15 mm. from its refracting surface.

From a comprehension of these cardinal points, it becomes possible to trace, in this simple eye, the course of any given ray of light; to find the points of conjugate foci; to ascertain the dimensions of retinal images, or of circles of diffusion which fall upon the retina in ametropia; and these values thus found may be considered equal to those which would exist under the same circumstances in the human eye, with its complicated apparatus, composed of two complete dioptric systems.

Should an opaque screen, having in it two perforations, each .5 mm. diameter, and 4 mm. apart, be placed before a Listing's



Listing's Eye, three times enlarged, showing, *a*, Hypermetropia of $\frac{1}{65}$; *b*, Myopia of $\frac{1}{65}$.

eye, its single surface would be converted into two minute lenses, prismatic in form, with their bases towards each other, and capable of forming independent images, which, when the length of axis is normal, fall upon the same point at the posterior focus. Rays of light from a source of illumination sufficiently

distant to afford parallel rays would pass through these two openings, would be refracted at the anterior surface, and would converge to a point at 20 mm. distant posteriorly, where the two images would be exactly superimposed and would produce the effect of a single picture; and in this transit would be afforded, as a fixed quantity for future use, a triangle of two sides, each 20 mm. in length, united by an arc of 4 mm.

Should the retina of this eye be either advanced towards or removed from its refracting surface, an ametropia would be produced; the images formed by the rays passing through the holes would fall upon it separated from each other in proportion to the departure from the length of the normal axis; and a single point of light, at a distance, for example, of twenty feet, would, in accordance with the law of projection, appear double; and the two flames would be apart to a greater or less degree, in accordance with the amount of ametropia.

These considerations lead to the search for some fixed quantity without the eye which shall bear a proportional value to the known measure within it, and the convenience of the metrical system leads me to propose for calculation an angle of 5 mm. radius, with arc or sine of 1 m., as equal to the angle of 20 mm. radius and 4 mm. arc with which we are already acquainted.

As a familiar illustration, let it be supposed that the two rays which are transmitted by the screen from a point of light five metres distant are two rigid wires, in contact anteriorly, passed through a screen, bent towards each other, and brought into contact 20 mm. from their posterior extremities. Should these posterior ends be moved apart, a much greater excursion would be made anteriorly; and if the separation at the former point should amount to 4 mm., the latter would be found distant about 1000 mm., since 20 : 4 :: 5000 : 1000. Furthermore, we are able to ascertain where these wires would converge before or, if prolonged, behind the screen, when their anterior extremities are separated either by being drawn asunder, or crossed upon each other. When, for example, the anterior extremities are drawn apart 250 mm., we say 250 : 5000 :: 4 : 80 mm.; and we thus imitate very nearly the course of the rays in a hypermetropia of 1-80 mm. or $\frac{1}{3}$, which diverge when they leave the eye as though they had their origin from a point

80 mm. or 3″ behind the nodal point. In like manner we imitate a myopia of $\frac{1}{3}$ by crossing the anterior ends and causing there a separation of 250 mm., when the wires would be found to converge and intersect each other at 80 mm. nearly in front of the screen.

From the last demonstration it arises, that if we are justified in using Listing's eye for comparison, and if we can clinically measure the distance between the double images as seen through the screen, we are able to ascertain where those rays, if prolonged, would unite, before or behind the nodal point, and thus determine in a very expeditious and happy manner the degree of ametropia.

For this purpose the patient is placed 5 metres distant from a small point of light, having before his eye an opaque screen with two perforations in it, each .5 mm. in diameter, and placed 4 mm. apart, through which, in the overlapping space between the two holes, as described in a previous paper, he searches for the double images. Myopia or hypermetropia may be determined by placing over one of the holes a piece of ruby glass, when one of the images will become red, and be found on the same side with the hole covered in myopia, but crossed and on the opposite side in hypermetropia, a result which is explained by the well-known law of projection.

Having ascertained the presence and kind of ametropia, the red glass is removed, and the distance apart of the two images is measured by means of another small flame or light held in the hand of the surgeon, which is brought into the patient's field of vision whilst he looks at the first mentioned fixed light. The second flame is moved in a line with the double images until the patient is able to say that one of the moving flames coincides with or overlaps one of the fixed ones, and that but three instead of four flames are perceived; and when this is accomplished, this distance of the fixed from the moving flame is ascertained by an ordinary rule or measure. Several other methods have been employed with success, and the ingenuity of each surgeon will enable him to overcome any difficulties he may encounter in these manipulative details.

The brief notes of a few cases will illustrate the use of this method.

Mrs. G., placed 5 mm. from a point of light (a gas-burner turned low), saw two lights through a disk, whose apertures were apart 4 mm., and the one colored red stood on the side of the hole covered with red glass, thus demonstrating myopia. A candle lighted and held by the surgeon was now brought near to the gaslight, and it also appeared double, but it could be distinguished from the gas by its motion and its larger flame. It was moved back and forth until the left-hand flame of the candle overlapped the right-hand one of the gas-burner; and, when this was accomplished, the distance from gas-burner to candle was measured with a common rule, and found to be five inches, or 121 mm. Then 121 : 5000 :: 4 : 165, which, reduced to English inches by dividing by 25.5, or to French inches by dividing by 27, gives 6.5 in English inches as the distance of convergence of the rays from the nodal point. The myopia was then found to be corrected perfectly by a $-\frac{1}{6}$ placed $\frac{1}{2}$ from the nodal point.

In a case of aphakia, after a successful operation for cataract, the distance between the double lights was found to be 10 inches, or 250 mm.; and $\frac{5000 \times 4}{250} = 80$ mm., or 3.2 inches. This case required for its correction a $+ \frac{1}{3}._5$, $\frac{1}{2}''$ from the nodal point, showing that the hypermetropia $= \frac{1}{3}$.

A case of hypermetropic astigmatism in a person able to give concise replies, and who could fully relax his accommodation, gave the following results. With the holes so placed as to analyze one meridian, the distance apart was $4'' = 101$ mm.; and in the meridian at right angles to first, 4.5, or 115 mm. Let x be the degree of ametropia, and we have the formula:

$x = \frac{5000 \times 4}{101} = 196$, or 7.7 in., which indicates that the rays diverge from this meridian as though they arose from a point 7.7″ behind its nodal point, and that a convex $\frac{1}{8}._2$ would suffice for its correction.

After atropia an $\frac{1}{8}$ was found sufficient, combined with a cylinder of $\frac{1}{5_0}$, to overcome the greater ametropia of the other meridian.

It will be found convenient to use the English measures for these calculations, and to reduce Listing's eye and the other quantities to the following values:

Radius,	5 mm.	= 0.2	English inch.
Anterior focus,	15 "	= 0.6	" "
Posterior "	20 "	= 0.8	" "

The distance apart of apertures in the screen, 4 mm. = 0.16.

The distance from observer to test-light, 5 metres = 200 inches nearly, or $16\frac{2}{3}$ feet.

The rule, then, would be to multiply the distance from the eye examined to the test-object by the arc of the small angle, and divide the result by the distance apart of the two lights, as ascertained by measurement.

Mr. W. suffers from a high degree of myopia, using $-\frac{1}{4\cdot 5}$, which does not fully correct it. The distance apart of the images was 8 inches. Then $\frac{200 \times 0.16}{8} = \frac{32.00}{8} = 4$. With $-\frac{1}{3\cdot 5}$ the double lights were perfectly fused together, and his myopia corrected.

Mr. M., with the disk so placed that a line uniting the holes was horizontal, saw the points of light apart $4\frac{3}{4}$ inches, and in the vertical meridian they were 3″ apart. $\frac{200\times 0.16}{4.75} = 6.7''$.

$\frac{200\times 0.16}{3} = \frac{32.00}{3} = 10\frac{2}{3}$. In these meridians the points of light were brought together respectively by $-\frac{1}{6}$ and $-\frac{1}{10}$, and the myopic astigmatism was fully corrected by a sphero-cylindroid lens, $-\frac{1}{10} \supset \frac{1}{16}$ cy.

Mr. D., myopic astigmatism; the images apart in one meridian 5 inches, in the other $1\frac{1}{2}$. $\frac{200\times 0.16}{5} = \frac{32.00}{5} = 6\frac{2}{5}$.

$\frac{200\times 0.16}{1.5} = 20$. A glass $-\frac{1}{5\cdot 5}$ corrected the greatest, and $-\frac{1}{20}$ the least myopic meridian, and a spherical and cylindrical of $-\frac{1}{20} \supset \frac{1}{8}$ cy was ordered.

It will be observed that, by the English measure, the formula is so simple that it can most readily be remembered, viz., 200×0.16, divided by the distance between the lights; and that a separation apart of $1'' = \frac{1}{3\cdot2}$ of ametropia. I have constructed a table, which will save the slight trouble of making even this short calculation.

Distance of Images apart.	Degree of Ametropia.	Distance of Images apart.	Degree of Ametropia.
$\frac{1}{2}''$	$\frac{1}{6\cdot4}$	$5''$	$\frac{1}{6\cdot5}$
1	$\frac{1}{3\cdot2}$	6	$\frac{1}{5\cdot3}$
$1\frac{1}{2}$	$\frac{1}{2\cdot0}$	7	$\frac{1}{4\cdot5}$
2	$\frac{1}{16}$	8	$\frac{1}{4}$
3	$\frac{1}{10}$	9	$\frac{1}{3\cdot5}$
4	$\frac{1}{8}$	10	$\frac{1}{3\cdot2}$

In selecting a glass for the higher degrees of ametropia, its distance from the nodal point must be considered, and a lens chosen for myopia $\frac{1}{2}''$ stronger, and for hypermetropia $\frac{1}{2}''$ weaker, than that which would be required after a calculation by the present method.

Having satisfied ourselves that an ametropia does exist in any given case, and that the visual axis is too long or too short, we can measure the axis with precision by using the Listing eye for comparison. We know that when an object is placed so near the eye as to give divergent instead of parallel rays, its image must fall behind the position of the posterior focus. These points of emission and convergence are the conjugate foci, and are found by the formula $f' f'' = F' F''$; f' being the distance of the object from the anterior focus, and f'' the distance of the image from the posterior focus; F' and F'' being the known quantities of the anterior and posterior foci. The proportion is $f' : F' :: F'' : f''$; hence $f'' = \frac{F' F''}{f'}$.

In the case of Mrs. G., we found a myopia of $\frac{1}{6\cdot5}$, and we know that an object distant $6\frac{1}{2}$ inches from her nodal point has its image on her retina. Should we desire to ascertain how much her visual axis is too long, assuming with the best authorities that it should be normally 22.23 mm., we subtract from $6.5 = 165$ mm. the distance from nodal point to anterior fo-

cus = 20 mm., and we have $f' = 145$; to find $f' = \frac{F' F''}{f'}$ we say $f'' = \frac{20 \times 15}{145} = 2.07$. The retina is 2.07 mm. distant from its proper position, and her axis is therefore 22.23 + 2.07 = 24.30 mm. in length.

The same formula is used for hypermetropia; but as the distance from the nodal point to the object is negative, f' is found by adding the distance of the point of convergence behind the eye to the distance from the nodal point to F'', and with hypermetropia of $\frac{1}{6.5} = 165$ mm. $f' = 165 + 20 = 185$, $f'' = \frac{20 \times 15}{185} = 1.6$. Subtract this quantity from 22.23, and we have the length of axis which gives rise to this degree of hypermetropia = 20.63.

An instrument for making these examinations has been constructed for me by Mr. Zentmayer, which consists of four disks of sheet-brass $1\frac{1}{2}$ inches in diameter, attached together by a pivot passing through a small projecting handle upon each disk.

No. 1 has in its centre a single perforation, 1 mm. in diameter.

No. 2 has 12 perforations, $\frac{1}{2}$ mm. apart.

No. 3 has 2 perforations, 3 mm. apart.

No. 4 has 2 perforations, 4 mm. apart, those in the last three disks being all $\frac{1}{2}$ mm. in diameter.

It is known that when an ametropic eye regards a distant point of light, a circle of diffusion must fall upon its retina; and that by the exclusion of peripheral rays, by means of a small perforation in an opaque screen, definition may be so much improved as to enable the point of light to be distinctly seen. A rapid to and fro motion of the screen will bring other portions of the diffused circle on the retina under the influence of the diaphragm, and the test-light will, to the observer, appear to dance in accord with these motions. Screen No. 1 is used for this purpose.

The entire circle of diffusion may be influenced by a series of perforations by the use of disk No. 2, through which the test-light will appear to the observer multiplied.

No. 3 has fixed in a groove a small slip of ruby-colored glass,

which may at will be pushed over one of its holes, and thus color one of the double images of the test-light red. Myopia is distinguished from hypermetropia in this manner, and this disk is used when the point of light is employed instead of the ordinary test-types, and a glass is empirically sought for which will fuse the two images and correct the ametropia. The overlapping space is larger than in disk No. 4, the double images are more easily found, and the examination of dispensary patients or children is made with precision and rapidity.

Disk No. 4 is employed for the calculation of ametropia in the manner and by the formula above described.

Note.—An ametropia $=\frac{1}{3\frac{1}{2}}$ is indicated when the two points of light appear to be 1 inch apart.

A band of light, passing through a slit in a screen $\frac{1}{10}$ inch in width, presents an angle of nearly two minutes at 16 feet—an angle of 1 minute being chosen by Snellen as the standard for normal acuteness of vision.

It follows that if this band should appear twice as wide, by becoming double, but not separated, it would indicate the tenth part of $\frac{1}{3\frac{1}{2}}$, or an ametropia of $\frac{1}{3\frac{1}{20}}$.

Three Cases of Herpes Zoster Frontalis seu Ophthalmicus. B. Joy Jeffries, Boston.

Case I.

H. M., a healthy woman, æt. 55, had, April 26, 1870, severe pain during the night on the right side of the forehead and face. She presented herself to me one week later with the evident results of an attack of herpes zoster ophthalmicus, namely, thin crusts on the forehead, both lids, side of nose, and upper lip under the right ala only up to the median line. There was also slight ciliary and some conjunctival redness, which, with the pain still present, had induced her to apply for treatment. She attributed the trouble to special exposure to cold on the day previous to the attack. A placebo was ordered and five days afterwards the only signs of the affection were a few thin crusts on the upper lip, just under the ala. It will thus be seen that the disease affected quite an extensive tract, but fortunately for the patient, was very mild, not leaving perceptible deep scars, or the frequent sequela of the disease, namely, severe persistent pain. The case confirms Mr. Jo na

than Hutchinson's statements that the eye is not affected unless the side of the nose is also. I report the case, as each of its kind is interesting, and it is moreover in such marked contrast to the one reported by me to the society two years ago, to be found with an extensive compilation in the Transactions of the American Ophthalmological Society, report of fourth and fifth annual meetings; still fuller in the Thursday, May 27, 1869, and following two numbers of the Boston Medical and Surgical Journal. Mr. Hutchinson's recorded cases number 41 in the 6th vol. of the Royal Lond. Opth. Hosp. Reports.

Case II.

A farmer, æt. 50, a patient of my colleague, Dr. Hay, who kindly turned the case over to me for report, was awakened in the night of Wednesday, June 8, 1870, by smarting and itching over the right scalp and forehead. The skin was red and swelled by the next day, and in two or three days pustules formed and broke out in groups. The skin "swelled as thick as the hand and as hard as a rock." The pain was such as to prevent sleep for a week, and evidently must have been very severe. The lid swelled so as to close the eye. The eye had a sensation as if something were in it, and the patient put in an eye stone, which produced conjunctival irritation and pain. The stone was removed by Dr. Hay when the patient applied to him a week after the commencement of the disease. At that time the ulcerations had an ugly bluish look, whether from any application or not was undetermined. The swelling had subsided. I saw the man on the fifteenth day of the trouble. The right lid was a little swelled, and its edge looked as if there had been some eruption on it. There was a group of crusts higher up on the lid, over the exit of the frontal, on the forehead, over the outer angle of the orbit, on the vertex a little transgressing the median line, behind the vertex but inside of Voigt's division of the frontal ramification, a large group high up on the forehead, making in all quite a number of ulcerations, with thick crusts. Redness had disappeared, although the patient said that side was a little more sensitive. The hair is very thin on the head, so that the scalp can be seen very readily. No eruption on nose, cheek, or lower lid. The

globe was not affected. Its conjunctiva somewhat reddened. Here again, without the history of the removal of the eye stone, Hutchinson's statement might have been doubted, that the eyeball escapes unless the branch supplying the nasal cutaneous surface is affected. The patient declared, however, he could not, with his glasses, read as usual, only making out large type.

Case III.

An Englishman, æt. 61, a patient of my colleague, Dr. Hay, by whom I am permitted to report the case, exhibited on the left side of the scalp and forehead, groups of scars, the evident results of herpes zoster frontalis. These are well seen, as the patient is quite bald where they exist. One group is behind the vertex, transgressing a little the median line, another half way between that and the centre of the left forehead, and a scar not so well defined over the exit of the frontal nerve. During the last week of March, 1870, the patient says he had an attack of erysipelas, which is corroborated by his son. His head was "sore for a week, and erysipelas followed it." He describes the clusters of pustules as situated where the scars are now to be seen. The eruption did not reach the nose or cheek. There was ptosis and swelling of the lid. People about him told him the skin was red and inflamed. The whole lasted some five or six weeks, and the skin was tender afterwards. I have no doubt from this, the patient's and his son's description, that the affection was herpes zoster. The special interest in the case is, that the eye was also inflamed, although the face escaped eruption, and without analysis, the case might readily have been reported as proving Mr. Hutchinson wrong in his statements. On inquiry, however, it was found that the right eye had been lost thirty years ago, and was producing sympathetic trouble in the left before the attack of herpes, *which seemed, however, to aggravate it.* Such was the condition of the left that Dr. Hay performed iridectomy on it, and enucleated the right at the same time.

Cases of Foreign Bodies in the Vitreous Humor. By Henry D. Noyes, M. D.

The two following cases are brought to the notice of the Society, because they present unusual and interesting features. The kind of injury is common, viz., penetration of the eyeball by a small bit of metal. It is not uncommon for suppuration to ensue, and to be expected that sympathetic irritation will be excited in the other eye. The cases reported derive their interest from the behavior of the vitreous humor when invaded by the foreign bodies.

The first case was seen two months after the accident, and is as follows:

Mr. S. B., æt. 54, merchant, residing in the interior of New York State, came to see me in January, 1869, in reference to the condition of one eye. Rather more than two months before, when striking a nail with a hammer, a little piece flew into his eye. Some bleeding was noticed, the eye was dimmed for a time, but did not become painful. There was an appreciable but not extreme loss of sight. Mr. B. stated that the foreign body entered the eye above the cornea; no mark or trace of its passage can be discovered.

The cornea is perfectly clear and free from scar, the pupil mobile, a little larger than the other, lens transparent and *in situ*, no attachments of iris to the lens.

Eye has central scotoma, and central vision cannot be determined. The extent of the scotoma is not recorded.

By ophthalmoscope the fundus could be well seen. The nerve was congested; at upper part of the globe the retina was rippled or corrugated, and there was irregular though faint choroidal pigmentation. At the lowest part of the globe there was a layer of serous effusion behind the retina. The most striking object within the eye was a small black body suspended in the vitreous humor, and held by a delicate flocculent band, which came down from above. It was nearly on the axis of vision, and so far forward that it could be seen in the direct image by a $+3\frac{1}{2}$ lens at $1\frac{1}{4}$ inches from the eye.

This was evidently the piece of iron which the patient felt penetrate his eye. Its color indicated that it had not under-

gone oxidation. The filaments by which it was held in place doubtless pointed out the course it had traversed. The wavy surface of the retina above also showed that here an injury had been sustained, and the presence of fluid at the lowest portion of the eye was additional evidence of the same thing.

Although no mark of penetration through either cornea, conjunctiva or sclera could be discovered, it was clear, from the patch of pigmentation in the choroid near the ciliary body at the upper part of the globe, that here the intruder had found entrance, and the metal had not passed completely across the eye, but had lost all its projectile force in penetrating the ocular tunics, and reaching its place of lodgment in the midst of the vitreous.

Notwithstanding the absence of irritation in this and the fellow eye, I could not look upon the foreign body as a quiescent and harmless resident, and presented to Mr. B. the risk which the other eye incurred, as well as the incurable damage which had befallen the injured eye. I thought it proper to attempt the removal of the foreign body, and deemed the operation feasible by aid of a mirror fastened to my forehead. It was likely that, in so doing, the sight would be much further damaged, and the eye might atrophy, but extirpation might be avoided.

The patient was unwilling to have the operation attempted, and left the city. I have not heard from him since.

Case II.—*Penetration of Foreign Body—Total Detachment of the Vitreous.*

Edward H., æt. 21, living in Brooklyn, N. Y., book-keeper, had his left eye hurt in August, 1868. He was raising a gun to his right shoulder to fire it, when the cap was exploded prematurely, and a fragment went into the eye. Sight was immediately and forever lost; inflammation continued three or four weeks. Some time after a secondary attack occurred, lasting about a week: no other attacks have followed. There have been paroxysms of pain in the eye, but not continuing more than an hour.

About the last of December, 1869, sixteen months after the injury, he began to see, when looking at a light surface, "bubbles"

of light before the other eye. Becoming more numerous and conspicuous, these appearances gave him such annoyance, that sometimes, when out of doors, he would become confused, and even nauseated. The spots are now both light and dark, and he has to look through a thin veil. In this eye, despite these symptoms, $V=\frac{2}{2}\frac{0}{0}$, $A=\frac{1}{6}$, can read for considerable time, but cannot write long, and has had, for this reason, to give up his business. Patient is not naturally courageous, and his troubles have disturbed him greatly.

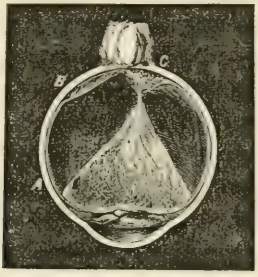
The state of the damaged eye is as follows: Form and tension normal; on the cornea above and to the inner side of its middle is an oblique scar about one line long; anterior chamber deeper than usual; the pupillary edge of the iris, at a spot opposite the corneal mark, adheres to a capsular cataract; the lens absorbed, saving a few scanty residua; the capsule in spots thickened, but has near its middle a perfectly clear opening through which we may get a glimpse of the deep parts of the eye; the iris not changed in color or texture. By ophthalmoscope mirror I obtain a faint reflex from the inner and upper parts of the fundus, but cannot form an image of any objects. When the eye is turned strongly downwards, can see a brightly glistening object floating in the vitreous and lying near the ciliary region. At this part of the fundus there is no intraocular reflex save from this object, and this looks like a piece of polished copper. Its bright lustre contrasts strongly with the absolute darkness of contiguous parts. Patient has perception of light in the outer and lower portion of the field, but none above.

Impressed with the idea that what I saw was the offending piece of percussion cap, I showed the case to some of my colleagues at the Eye and Ear Infirmary as a rare specimen. They could not see the object with sufficient clearness to accept my interpretation of it, and I made repeated examinations, only to be more strongly convinced that this was the foreign body: 1. because it shone, when illuminated, with extraordinary brightness; from the distance of $2\frac{1}{2}$ feet it was very conspicuous, the rest of the fundus totally dark: 2. it had a metallic lustre, unlike anything I have seen due to mere morbid anatomy: 3. the track of a foreign body through cornea, iris and

lens could be easily seen: 4. what other supposition was so probable? Objection was made that a bit of copper could not be expected to keep its bright color for so long a time within the eye, viz., twenty months.

My *diagnosis* was, that there was detachment of the retina at the lower and outer parts of the fundus, and that a piece of copper cap was floating in the anterior and lower part of the vitreous.

As to treatment, there was no divided sentiment. The eye was extirpated and put into very dilute chromic acid, and on the fifth day afterwards was examined. A section was made in the horizontal meridian. My diagnosis, as regards the presence, situation and character of the foreign body, was confirmed; but, as to the condition of the retina, was erroneous. I had to deal with detachment of the vitreous, and not with detachment of the retina. You have the specimen before you, and see that the lens and capsule are reduced to a



thin wafer-like disc; that the retina and choroid are almost perfectly in normal position—the slight separation of the retina having occurred since the specimen was examined; that there is a funnel-shaped web of delicate fibres of connective tissue whose apex is attached to the back part of the globe, near the yellow spot, not at the optic entrance, and whose base is at the iris; that a small bit of copper is entangled in this mesh of fibres very near the ora serrata, and that it has the fluted surface of a percussion cap. The space outside of the conical net-work of fibres was filled with serous fluid.

It appears evident that the foreign body passed quite across

the eye, impinging near the yellow spot, and bounded forward to lodge at the lowest part of the globe, not far behind the lens, after the manner that Berlin has pointed out. The subsequent morbid process seems to have been the gradual development of connective tissue in the vitreous, its contraction, and separation from the retina, giving rise to an effusion of serum ex vacuo in front of the retina; that the foreign body has been lifted up on these growing and contracting fibres so as to take its present position. The specimen has been well mounted by my friend, Dr. Eno.

The effect of extirpation has been to relieve the patient of nearly all his morbid symptoms. He has no more nausea, can use his eye comfortably in both reading and writing, has few of the phantasms which he had before. Wears an artificial eye.

The detachment of the vitreous might perhaps have been diagnosticated if a similar case had ever before fallen under my eye. Certainly I shall look more carefully for retinal vessels as a means of distinguishing this condition from retinal detachment; but it might not be possible to arrive at any more correct conclusion, because the interior of the eye could be inspected only through the net-work of the capsular obstruction in the pupil.

Foreign Body in the Eye, Diagnosticated by Limitation of the Visual Field. By Thos. R. Pooley, M. D., of New York.

In the Archives of Ophthalmology and Otology (Vol. I., No. 1), Dr. R. Berlin, of Stuttgard, calls attention to the importance of a limitation in the visual field found shortly after the wounding of the eye, not only for the detection of the presence of a foreign body, but also for the discovery of its position.

Since reading Berlin's remarks on this subject, I have had an occasion to test the value of this symptom in a case which came under my care, and in which I not only diagnosticated the presence of a foreign body, but also its position. The patient came to Dr. Allin's clinic, at the New York Eye and Ear Infirmary, to whose kindness I am indebted for permission to report the case. Four hours before presenting himself at the

Infirmary he was striking a piece of hot iron with a hammer, when a piece of steel flew off the latter and struck him forcibly upon the left eye.

There was a wound about 3‴ in extent along the upper and inner sclero-corneal margin. The lens was uninjured; considerable hemorrhage into the anterior chamber. Pupil dilated only slowly under atropine. There was good quantitative perception of light. Tension of the eye was much diminished, and the globe sensitive on pressure. The field of vision was carefully tested with a candle flame, and found to be completely failing in the upper and inner quadrant. I therefore diagnosticated the presence of a foreign body in the eye, and, from the direction of the defect in the visual field, located it in the outer and lower section of the globe.

Enucleation was at once proposed, but the patient would not then submit to the operation. The following day, however, he returned, with the request that the operation should be performed. He had suffered intense pain. The conjunctiva was swollen and chemotic; the anterior chamber filled with pus; cornea still clear; abundant purulent discharge from the wound.

The eye was extirpated, and, upon opening it, immediately after removal, a small irregular spicula of steel was found in the lower and outer part. The foreign body had passed through the retina and choroid, and was found impacted in the sclerotic. The course of the wound could be traced through the vitreous obliquely outwards and downwards. A distinct depression in the sclerotic marked the place where the foreign body had lodged, and there was considerable hemorrhage around it.

I did not attempt to remove the foreign body in the manner recommended by Berlin, by making a section along the lower edge of the cornea—the ordinary cataract section—for the reason that the patient was a laboring man, depending for the support of his family upon his daily labor, and had I succeeded in thus removing the body, the subsequent process of suppuration and atrophy of the globe would have been much slower than the healing after enucleation.

Some Curious Phenomena Resulting from Reflex Nervous Action in Consequence of Traumatic Lesion of the Eye. By Charles A. Robertson, M. D., Albany.

A. W. S., aged 41, a horse-car conductor, was sent to me by the late Dr. Brinsmade, of Troy. He was a large, robust-looking man: said that he was perfectly healthy, and temperate in his habits.

The accident to his eye, the left, occurred, as he stated, by his rising suddenly, after picking up some wood, and bringing the brow into violent collision with the end of a projecting board. Severe pain soon ensued, which lasted thirty-six hours. A physician was called in, who made cold applications to the injured parts, and purged the patient vigorously. What other treatment was adopted I am unable to state, as I made no note of it at the time. He remained under the charge of this gentleman until he was sent to me by Dr. Brinsmade, on whom he had called, as physician to an *accident insurance company*, in which patient had a policy. He called there because a professed medical agent, sent by the company, had visited him and tried to effect a settlement of the matter by offering a sum of money to be paid down at once, instead of the weekly allowance to which patient was entitled for a certain period of his disability; giving assurance, at the same time, that the hurt to the eye, although seemingly severe, was not alarming, and that the sight would be saved.

On examination, I found the cornea staphylomatous, and its upper segment blending into a bluish staphyloma of the sclera. The cornea had lost its transparency in a great degree, and the anterior chamber was red and turbid with bloody effusion, so that no view of the iris or pupil could be obtained. The tension of the ocular globe was extreme, but no complaint expressed of tenderness on pressure. The conjunctival and sclerotic vessels were hyperæmic, and the cornea insensible to the touch. No pain was felt, and a slight uneasiness, varying in degree, was alone complained of by patient. Quantitative perception of light did not exist. There was no cicatrix or evidence of contusion on the brow where patient supposed the blow had been received, but the disorgan-

ized condition of the eye made it indubitable that the violence had been expended on the globe itself, and that the lesion involved the superior quadrant of the ciliary ring. Prognosis was decidedly adverse as to future usefulness or tolerance of the *presence* even of the eye. Patient was advised that the staphyloma would undoubtedly increase, that enucleation of the ball or abscission of its anterior segment would become imperative, and that it was for his interest to submit to an operation without delay, since a constant danger of sympathetic ophthalmia in the other eye was imminent. Patient shrank from surgical interference, and would not permit even paracentesis of the cornea. A few drops of a solution of sulphate of atropia were instilled into the eye, and protective glasses advised, partly to conceal the deformity, which greatly concerned him, and partly to guard the tender organ from further violence. These, and the atropia, with rest at home until all uneasiness in the eye had gone, comprised all the treatment advised.

Patient called at intervals for several weeks, and, except slight irritation felt in the eye occasionally, and perhaps very little increase of staphyloma, he appeared to be doing well, and resumed his usual occupation.

About two months, however, after his first visit at my office, I found that the staphyloma had very greatly increased. I again urged operative procedures, and this time with success. An appointment was made to have the operation done the following day at his house; but, before the appointed time arrived, notice was received that a rupture had occurred and the swelling gone down. Patient was highly gratified, as he supposed that he had escaped a dreaded surgical operation. His joy was very brief, however, for in a day or two the ruptured parts reunited, and the staphyloma became as bad as ever. The rupture recurred once or twice afterwards, as I heard, but I saw nothing of the patient.

At length, after an interval of several months, patient's wife came to see me, and asked me to visit her husband, who was very ill. In company with the attending physician, I saw the patient on the following day. The statement then made was, that after ailing for a good while, he had been seized two

weeks since with what were regarded as precursory signs of typhoid fever. The opinion of the physician was, at the present time, however, that some disorder of the kidneys existed. The patient was exceedingly weak and without appetite. Pulse was full and soft: skin moist, but sometimes (as stated to me) dry and hot: tongue moist, coated white: urine scanty and bowels constipated. A frequent twitching, or spasm of the body occurred. Expression of the face dull, almost stolid. The fingers of one hand were constantly rubbing and working on the *ala* of the left nostril. Patient made no remark except when questioned; or when startled by a sudden noise. In answer to question, he said his eye did not hurt him, but he had darting pains in the head. The staphyloma was larger than I had seen it before. His manner was listless, and his mind enfeebled rather than delirious, although he was sometimes decidedly delirious at night, as his wife stated. He would wake frequently, as if from a frightful dream, and spring up excitedly in bed, trembling with terror, and it would be long before he regained his composure. Even when awake, and in the daytime, a sudden noise in the house or street would startle him and make him exclaim, while shaking with fear, "What's that?"

On consulting with the attending physician, I stated my opinion to be that all the symptoms were due to perverted action of the reflex nervous system, and that the diseased eye was the exciting cause of all this perturbation. I urged the immediate abscission of the front of the globe, since the patient had previously refused to have the entire ball removed. He smiled at what seemed to him the absurdity of my opinion. He concurred with me that the eye was a hideous deformity, and that the patient could endure an operation for its removal, and with that view he would not oppose an operation as an experiment to confirm or subvert my opinion. Accordingly chloroform was procured and the patient anæsthesized. A liberal abscission was made, according to the method of Mr. Critchett, of London.

A wire speculum was introduced to hold the lids apart, which, in this instance, was improvized from a lady's hair-pin, since no better was at hand. Several curved needles, armed

with silk, were caused to transfix the eyeball, and the parts of the eye in front of them were removed by an elliptical incision. The edges of the aperture were then brought into apposition by drawing the needles through in succession and tying the sutures. Lint was laid over the closed lids and retained by a bandage, which exercised a gentle and uniform pressure. The wound healed kindly, and on the fifth day the sutures were removed.

All perverted nervous action ceased after the operation. During the first night the sleep was refreshing and but little disturbed. In a week after removal of sutures the patient came to my office to show himself, having travelled eight miles. All local irritation had subsided, and an excellent stump existed for the support of an artificial eye. He called himself a well man.

The nervous phenomena of this case are exceedingly interesting. From the appearances presented by the eye, it was evident, as before said, that the chief violence of the blow was expended upon the superior portion of the ciliary region of the eyeball, and not upon the brow. The iris and ciliary region, and to some extent the cornea, are supplied by filaments of distribution from the ophthalmic or ciliary ganglion of the great sympathetic nerve, situated on the outer aspect of the optic nerve in the posterior region of the orbit. A few of the ciliary nerves are derived from the naso-ciliary nerve. This ganglion serves as a medium of connection between the trifacial (branches of which are largely supplied to the cornea) and the oculomotor, or third pair. The nasal nerve is a branch of the frontal, and, besides its ciliary relations, is also joined by a filament of the sympathetic.

These nervous connections will account for the irritation about the nose, the head pains, and the cerebral symptoms, while the spasms and other constitutional disturbances were doubtless caused by irritation of terminal branches of the great sympathetic nerve.

Quinine as a Local Remedy in Certain Forms of Conjunctival and Corneal Disease. By J. S. Prout, M. D., of Brooklyn, N. Y.

Adolph Martin, in extending the investigations of Binz and Scharrenbroich concerning the influence of quinine in checking the amœboid movements of the white blood corpuscles (Das Chinin als Antiphlogisticum. Inaugural-Dissertation der Med. Facultät zu Giessen. Giessen, 1868), reached the following conclusions:

1. Quinine limits the pathological migration of the blood-corpuscles into the tissues of the membranous and parenchymatous organs exposed to the air, both when given subcutaneously and when it is directly applied to the part.

2. It produces this effect, (*a*) by impairing the vital properties of the existing white corpuscles, (*b*) by hindering the generation of new white corpuscles, and (*c*) by restraining the dilatation of the vessels.

3. Quinine acts as an antiphlogistic, by reducing all the visible factors of suppurative inflammation.

4. The use and efficacy of quinine in other pathological conditions distinguished by multiplication of white cells, *e. g.*, typhus, leukæmia, etc., is based upon and explained by its relations to the life and formation of these corpuscles. (V. London Practitioner, August, 1869, p. 107 *et seq.*)

These conclusions induced me to try the local effects of quinine in some of the cases under my care in the Brooklyn Eye and Ear Hospital. I will give two, the notes of which were furnished me by the very efficient House Surgeon, Dr. D. Webster.

Case I. J. J. Murphy, æt. 14, of robust physique, came to the hospital in the summer of 1868 for treatment for granular lids. In the early part of 1869 he was made an in-door patient. Improvement was quite rapid, and he was sent home, with instructions to attend regularly for treatment. He did so irregularly, and as a result his vision became so bad that he could not find his way to the hospital. His hygienic surroundings were bad. He then went to the New York Eye and Ear Infirmary, where Dr. Althof did a canthoplastic

operation on the right eye. On Dec. 28, 1869, he was again admitted into the Brooklyn Eye and Ear Hospital. He had no useful vision. The cornea of the right eye had a fleshy appearance, had been perforated by an ulcer, and the anterior chamber was obliterated. In the left eye the cornea was opaque and vascular.

An alum wash was prescribed; the alkaline hypophosphites were given with cod-liver oil, and a daily hot bath was ordered. Two days later I did a canthoplastic operation on the left eye. Dry unbleached sulphate of quinine (hospital quinine) was dusted into the right eye daily. As soon as the left eye recovered from the immediate effects of the operation, the quinine was also applied to it. These local and general measures were continued until the 4th of February, when he was sent home with a supply of the quinine.

April 19. He has used the quinine continuously, and also a mild alum wash. He can now read newspaper editorials (No. 7 Jaeger) with the left eye; there is no useful vision in the right. He is able to support himself by work.

The applications were at times quite painful, though never so much so as the sulphate of copper crystal. The pain, as a rule, would not last half an hour.

The most effectual method of application was found to be to put the dry quinine on the everted lid, the lid being at once replaced.

This boy had had all the usual methods of treatment. During his first stay in the Eye and Ear Hospital, his eyes improved on the usual treatment—sulphate of copper, etc.—but to the improved hygienic condition in which he was placed in each period of in-door treatment must be attributed a fair proportion of the improvement. He distinctly recognized, however, that the applications of the dry quinine caused more improvement in vision than any other agent that had been used.

Case II. Helen C., æt. 17, chambermaid, was treated for granular lids in hospital (Rochester, N. Y.) for six months, and was discharged, apparently well, in the spring of 1869. She came to the Brooklyn Eye and Ear Hospital, April 22, 1870. There was then so much pannus that she could not find her

way alone through the streets. First, sulphate of copper crystal, and then a ten-grain solution of nitrate of silver were applied. She was in fair condition as to weight, but weak and pale, and without appetite.

April 26. She became an in-door patient, and was treated with the dry quinine, used as already described, until about June 5th, when I applied to the everted upper lid a mixture of sulphate of quinine, carefully powdered and rubbed up with glycerine (ʒss to fʒj). This was quite as severe in its painful effects as the dry crystals (in part, perhaps, due to the glycerine). I next, a few days later, used a solution of the muriate of quinine (℈ij to fʒi) in distilled water, which was afterward applied every 24 or 48 hours. No special internal medication was used.

June 30. She can read ordinary print with the left eye, and the cornea of the right is rapidly clearing up. The palpebral conjunctiva presents a nearly healthy appearance, more that of the normal membrane than is usually seen after such an amount of disease.

This patient distinctly perceived that the opacity became less under the use of the quinine, and more decidedly after each application than after the use (occasional) of the sulphate of copper or alum crystal.

In applying the solution, in this and other cases, I have used a small camel's hair pencil, painting it over the everted lid, or letting it run off the pencil under the lid lifted from the ball. It smarts sharply at the moment of application, but this does not last long.

Once a rather free application of the dry quinine caused an unpleasant degree of reaction for about 24 hours, but without injurious result.

I have used quinine, in one or other of the forms spoken of above, in several other cases, but in none in which the results were more appreciable than in the two given. In a case of traumatic keratitis, showing a tendency to spread, and threatening perforation, in spite of paracentesis three times repeated, improvement and cure of the ulceration, with, of course, resulting opacity, followed the daily instillation of a solution of the muriate of quinine (℈ij to fʒi.) in distilled water.

I was induced to try quinine by the results of Martin's re-

searches. Since using it I have been informed by my colleague, Dr. Mathewson, that he had seen it in use at Wecker's clinic, but by him reserved for the worst cases. If it is found really efficient in these, it is not logical or proper to restrict it to such.

In the Annales d'Oculistique (T. LXIII., 1870, p. 199), in a report of the proceedings of the Ophthalmological Society, held at Heidelberg, 1869, there is a reference to a paper by Prof. Nagel, of Tübingen, on the use of solution of quinine as a collyrium. He used the muriate in solution, being induced to do so by the researches of Binz, in conjunctival and corneal affections. He has observed several cases in which it seemed to him to possess more curative power than the usual topical remedies. He mentions chronic catarrhal conjunctivitis, certain forms of phlyctenular or pustular conjunctivitis, and more particularly diffuse suppurations of the cornea. He refers to a case in which, after extraction of cataract, the cornea became infiltrated with pus, and loss of the eye was threatened. After the third day a solution of muriate of quinine was poured into the eye and held as long as possible in contact with the cornea and conjunctiva. This was not very painful. The result was much better than could have been expected. At the end of a few hours there was a notable amelioration, and in a few days the infiltration had disappeared. The patient was discharged, able to read fine print (feine schrift).

Nagel explains its action by its effects upon the extravasated blood corpuscles. He does not give the strength of the solution employed, nor the frequency of its use. (V. Klinische Monatsblätter für Augenheilkunde, Nov., Dec., 1869, p. 430.)

I have found that 160 grains of the muriate of quinia can be dissolved in one fluid ounce of distilled water by the aid of heat, but it recrystallizes on cooling; a solution of half this strength being carried in a vial in a vest pocket, was good for three or four days—then it in part recrystallized. At a summer temperature I have found a solution of 40 grains to the fluid ounce permanent and apparently of effective strength.

The Channel by which, in Cases of Neuroretinitis, the Exudation proceeds from the Brain into the Eye. By Dr. H. Knapp.

Recent anatomical researches by Schwalbe and Schmidt on the lymphatic spaces of the eye, show that a communication exists between the arachnoidal space of the brain and the intervaginal space of the optic nerve, terminating at the lamina cribrosa. Before these researches this communication must have been clear to every one who bore in mind that the outer sheath of the optic nerve is a continuation of the dura mater, which the nerve receives at its exit from the optic foramen, while its inner sheath is an extension of the pia mater enveloping the optic trunks already in the brain. Thus it is clear that any liquid in the arachnoidal space has no difficulty in penetrating into the intervaginal space of the optic nerve, which, although containing some very loose connective tissue and elastic fibres, is but an extension of the arachnoidal cavity.

I have been convinced, for several years, from pathological and clinical observations, that blood and exudation are not always stopped at the lamina cribrosa, but may find their way through it into the eye. I was led to this opinion, about nine years ago, by one of those extremely rare cases of pigmentation of the optic disk (published in Græfe's Arch., xiv., 1, pp. 252–261). The pigment, in these cases, lies only on the periphery of the papilla, and encroaches a little upon the retina. I thought from the first, that this pigment resulted from blood, and since it was confined to the region opposite the termination of the intervaginal space, I concluded that the blood had oozed from there into the eye. By some specimens in Henry Müller's and Iwanoff's collections, I convinced myself of the occurrence of isolated hemorrhage in the intervaginal space of the optic nerve. In 1867 I directly observed, in a case of injury of the orbit, the transmission of blood through the intervaginal space into the eye, and its gradual metamorphosis into pigment. The case is described in the place quoted above, and illustrated by a chromo-lithographic picture of the ophthalmoscopic appearance of this eye.

That exudation takes its way from the brain through the

intervaginal space of the optic nerve into the eye, I am now able to prove by clinical facts. Every one of you must have been struck by the fact, that sometimes very good vision exists in eyes which show, ophthalmoscopically, high degrees of neuroretinitis. This would be inconceivable if the exudation travelled from the brain through the nerve itself; for it could not leave its function of being the conductor of the retinal impressions so perfect. In two cases which came under my observation last winter, I found very highly developed neuroretinitis with $S=\frac{1}{3}$ in the one, and $\frac{1}{5}$ in the other. I measured the extent of Mariotte's blind spot, which, in the first case, was, in diameter, two and a half times as large as in a healthy eye; and, in the second case, about four times as large, extending very near the point of fixation in either eye. This latter was one of the most advanced cases of neuroretinitis I have ever seen. The original disease was a bony tumor, causing afterward exophthalmus of the right eye, and total blindness of both. There was no restriction of the visual field in either case. The first case ended in recovery; the second cannot be far from a lethal termination.

This enlargement of Mariotte's blind spot can, to my mind, only be explained thus: The exudation—fluid and white blood corpuscles—travels from the arachnoidal cavity into the intervaginal space, oozes through the periphery of the lamina cribrosa, and expands into the soft tissues around the margin of the optic disk, the suprachoroid, choroid proper, and retina. The optic nerve fibres of the latter, situated farthest from the origin of the exudation, will be attacked least and last. The rods and cones, however, the peripient layer of the retina, will be affected sooner, and have their function either destroyed or, in case of recovery, kept in abeyance. The enlargement of Mariotte's blind spot, which I found to correspond to the extent of the exudation visible with the ophthalmoscope, proves this conclusively. In addition, I may strengthen this theory by the following facts: The rods and cones are delicate organs, and more easily destroyed than the nervous fibres. The exudation, seen through the ophthalmoscope, has its summit at the margin of the optic disk. Extending in both directions, between the fibres of the optic nerve entrance, and into the cho-

roid and retina, the most destructible parts it meets on its way are the rods and cones, the nutrition of which, moreover, is dependent rather on the choroid than on the retina. If the exudation passed through the optic nerve itself, there would be, in consequence of a like pressure on *all* the nervous fibres, an equal diminution of visual acuteness over the whole field of vision. The anatomical study of specimens alone can fully explain this process. But since this has not yet been done, and specimens are exceedingly difficult to obtain, I thought it well to present my views on this subject before the members of this society, thereby calling their attention to it, in order that no opportunity may be lost, both with regard to the clinical observation and the anatomical investigation of neuroretinitis.

Demonstration of Ophthalmoscopic Drawings. By Dr. H. Knapp.

Dr. H. Knapp exhibited drawings, made by himself with colored crayons, of some rare ophthalmoscopic appearances, and accompanied them with explanatory remarks, of which the following is an abstract:

1. *Non-inflammatory, excessive hyperæmia of both retinæ.* The patient had enlargement of the heart, without valvular anomalies, general cyanosis, aneurismal bruit at different points of his body. His retinæ were so vascular, that a countless number of thick and tortuous arteries and veins arose from the optic disks and branched radiating toward the periphery like a caput Medusæ. The area and borders of the optic disks were totally concealed. The yellow spot was distinctly discernible. A great number of arterial and venous twigs reached to the fovea centralis. The retinal tissue, refracting media, sight, and visual field of both eyes were perfectly normal. The patient died in the hospital of Heidelberg eight years ago. His body exhibited a general enlargement—hypertrophy—of the whole vascular system. I have not heard of a similar case.

2. *Perivasculitis choroideæ.* This condition of the choroidal vessels has not yet been described, as far as I know. The pic-

ture is taken from the eye of a short-sighted woman, 40 years of age, whom I examined, not long ago, in New York. She had some floating opacities in the vitreous, staphyloma posticum, and superficial choroidal atrophy. The scarcity of pigment in the eye admitted of a thorough examination of the choroidal vessels in places also where there was no atrophy. Some of the larger vessels had sharp white margins, broader than we see in cases of marked retinal perivasculitis. The column of blood in these vessels with sclerosed walls was not diminished in calibre.

3. *Retinitis pigmentosa—Excessive perivasculitis retinæ.* This picture is taken from a girl, 22 years of age, suffering from complete congenital amaurosis. The pigment shows its ordinary concentric arrangement, is intermingled with whitish flakes, and ceases in a circular line, the centre of which lies midway between the sclerosed region of the yellow spot and the optic disk. The latter is shining white, and irregular in outline. The remarkable feature of the drawing, however, lies in the *excessive atrophy* of the retinal vessels. Three central branches are only distinguished by the closest observation as extremely slender red lines, without any special contour, while a larger number of entirely white thin stripes emanate from the papilla according to the ordinary ramification of the retinal vessels. The increase of connective tissue in their walls is so excessive as to obliterate their calibre completely.

4. *Peculiar form of Retinitis pigmentosa.* The case is that of a lady, 35 years of age. Diminution of sight for ten years, very slowly progressive. Parents not related. Both eyes alike. Ordinary pigmentation of peripherical parts of retina, ceasing in a circular line, the centre of which is situate between yellow spot and optic disk. The upper and outer quadrant of the fundus oculi free from pigmentation, in fact, perfectly normal. The region of the yellow spot and its surroundings, whitish opaque, studded with the characteristic bone corpuscle-like pigment spots. Throughout the whole retina, except in the outer upper quadrant, white diffuse specks were scattered among the black ones. There was *no* contraction of the visual field, but a large central scotoma, corresponding to the degeneration in the region of the yellow spot. Eccen-

tric vision *not* materially impaired; she fixed eccentrically, with her eyes turned upward, counted fingers at a distance of four feet. She sees the stars in the evening, and does *not* find her sight much worse at night than during the day. She is red-blind, but recognized the other colors.

5. *Circumscribed choroidal hyperæmia and initial state of detachment of the retina.* Beyond the yellow spot there were two bluish stripes of detached retina not much raised over its level. Around the region of the yellow spot the fundus oculi had a peculiar, puckered appearance. It was traversed by irregular red ridges, like the leaf of the victoria regia. This condition indicates, it would seem, circumscribed choroidal hyperæmia, the injected, and therefore swollen vessels, seen through the overlying as yet unchanged retina, produce a design similar to the appearance of a hyperæmic iris. The next step of this morbid state probably is serous exudation and detachment of the retina, which, in this case, had already begun in the vicinity.

6. *Characteristic appearance of Retinitis Brightii.* The condition of the retina illustrated here was described about ten years ago by Von Græfe as being the most characteristic of Bright's retinitis. White streaks radiate from the centre of the optic disk, leaving an oval space between the disk and the fovea centralis free. Two rows of concentric white patches are situated around this space. The peculiar arrangement, seen in the drawing, results from two neighboring vessels. Their trunks form a red line between the two rows of white specks, which are separated by the small branches arising from the trunks. The white specks, therefore, correspond to the capillary net of the minor branches.

The Light Streak seen in the Centre of the Retinal Vessels with the Ophthalmoscope. By Edward G. Loring, M. D., New York.

Shortly after the invention of the ophthalmoscope, Helmholtz,* as you are aware, in his description of the instrument, advanced the statement that the arteries of the retina were to

*Beschreibung eines Augenspiegel. Berlin, 1851, p. 34.

be distinguished from the veins by their double contour which was visible under the ophthalmoscope.

A little later Van Trigt* showed that this was not the case, and pointed out that what Helmholtz had mistaken for the double contour of the arteries was, in all probability, the brilliant light streak occupying the centre of the vessel, which was common also, though in a less degree, to the veins. Van Trigt was the first to ascribe this light streak to the reflection toward the observer of those rays of light which, under the ophthalmoscope, struck upon the anterior surface (vorderfläche) of the arteries.

Jæger, in a paper† written in 1854, accepts this explanation, and is particular to give a full and detailed account of the phenomenon. And as this account has been accepted by all the leading observers as the correct one, and as it forms the basis of the following remarks, I will give it in Jæger's own words (p. 328, *loc cit.*):

"The lighter red and more brilliant color of the arteries correspond to their clearer blood, as well as to the stronger light-reflection from their walls. The lighter and clearer centre of the arterial, as well as venous vessels in its entire extent (on account of which they, at that place, appear more transparent, as if seen by transmitted light, and on account of which they appear to have on each side a single dark contour), is in fact only produced by increased reflection of the rays from the surface of the vessels; or, in other words, those rays which fall on the summit of the curvature of the vessel (relative to the axis of vision) are mostly reflected back in the direction of the rays entering the eye; while, on the contrary, the rays which fall upon the descending portions of the curved surface of the vessel are, for the most part, reflected in a sidewise direction.

"The vessels are, in fact, in their entire breadth of a perfectly uniform color, and allow no light to pass through them; for which view not only do the extent of their diameter, clear centre and dark contours speak, but what would also follow

* Dissertatio Ophthalmologica inauguralis de speculo oculi. Utrecht, 1853.

† Ergebnisse der Untersuchung d. mensch, Aug. m. d. Augenspiegel vorgelegt in der Sitzung, von 27 April, 1854.

from this, namely, that the vessels precisely there, where they run perpendicular to the observer's axis of vision, show a clear centre, but lose the same when they run in a direction relatively oblique to this."

Mauthner, also, in his recent work on the ophthalmoscope (1867), accepts Van Trigt's and Jæger's explanation of the phenomenon, and distinctly states, that "since the wall of the vessels (Gefässwandung) reflects sufficient light to make itself independently visible, so must the light streak be the expression of this light-reflection."*

Jæger, however, in his last work,† published in 1869, though he still adheres to his former explanation, and refers the reader to the passage just quoted, adds the following note:

"The central vessels, where seen by the ophthalmoscope, appear as if bordered on each side by a single contour, while, however, under the microscope, they show a double one. This difference is due to the fact that the walls of the vessels and retina are very nearly equally transparent; so that with the ophthalmoscope, under physiological conditions, it is only the red blood-columns, and not the walls of the vessels, that are seen. Consequently the vessels are not perceptible in their entire diameter. The red blood-column reflects back toward the mirror the greater part of those rays of light which are thrown by the ophthalmoscope on its central portion, which, therefore, appears illuminated and brilliant, while, on the other hand, the lateral portions reflect the light falling upon them, mostly in a sidewise direction, and consequently appear dark. They are, in fact, only apparent to the observer through diffuse reflected light. The single dark contour of the central vessels under the ophthalmoscope marks, consequently, the limit on either side of the red-colored portion of the blood-column, while, on the contrary, the double contour revealed on each side of the vessel by the microscope, marks the outer and inner limit of the walls of the vessels themselves. Consequently, in regard to the central vessels, so far as the ophthalmoscope is concerned, the expression 'vessel' is, strictly

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* Lehrbuch der Ophthalmoscopie, p. 244.

† Ophthalmoskopischer Hand-Atlas, 1869, p. 32.

speaking, incorrect, and should be rather blood-column. The other vessels seen in the fundus of the eye, especially those of the choroid, possess walls which are so little transparent that they are visible as such for their entire diameter, and consequently their red blood-column is not independently recognizable."

It will be thus seen that Jæger gives up the idea that the light is reflected back from the walls themselves, for the reason that they are too transparent to produce sufficient reflection. And in this he is undoubtedly correct.

Eliminating, therefore, the vessel wall as a factor to any perceptible degree in the production of the light streak, there still remain two direct statements which appear to me to be unfounded, notwithstanding the high authority from which they come. They are:

1. That the reflection takes place from the red blood-column.
2. That no light traverses the vessel.

I believe, in fact, just the opposite, namely, that the light striking the wall nearest the observer passes through this on account of its transparency without being reflected to any appreciable degree, *traverses the contents of the vessel, and is then reflected back slightly from the opposite wall, but principally from the subjacent tissues.*

The views advanced above will be made clearer by a diagram.

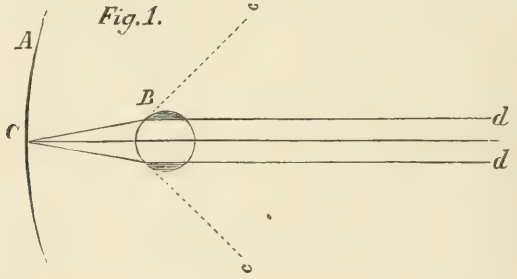
Let the following figure represent an enlarged section of the retina in which the line *A* represents, we will say, the external limitans and choroidal epithelium, which we will assume to be the principal reflecting surface of the fundus, and let the circle *B* represent a transverse section of one of the larger vessels in front of *A*.

We will suppose the fundus to have been illuminated by the ophthalmoscope in the ordinary way, and that the rays represented in the diagram are all return rays. Now, these rays, whatever direction they may assume after passing through the dioptric system of the eye, must *start* from the reflecting surface* *A* as *divergent* rays. Thus the rays leaving the illumi-

* We have assumed this for the sake of illustration. Light must, however, be reflected in a greater or less degree from all the different membranes at the bottom of the eye.

nated point *C* will be divergent, and strike as such on the vessel *B*, lying in front. The central, or less divergent rays, which fall upon the vertex of the curvature of the vessel and its immediate neighborhood, pass through the vessel and enter the eye of the observer; thus the centre of the vessel appears to him illuminated; while, on the other hand, the outer or more divergent rays striking on the descending portions of the vessel do not, in an equal degree, enter the eye of the observer, and therefore the outer borders of the vessel appear darker, which may be represented diagramatically as the space included in the figure between the dotted line *c c* and the straight line *d d*.

Fig. 1.



Thus we see that the effect which Jæger says is "the same as if produced by transmitted light," is, in fact, so produced; for, if we look upon the reflecting surfaces of the fundus of the eye after they have been illuminated by the ophthalmoscope as the *source* of light, then we have the vessel between it and our own eye, and the conditions are precisely the same as those which pertain to transmitted light passing through a tube.

As this whole matter is merely a question of physics, the same phenomenon ought to follow wherever the conditions are the same, or similar to those which obtain in the eye.

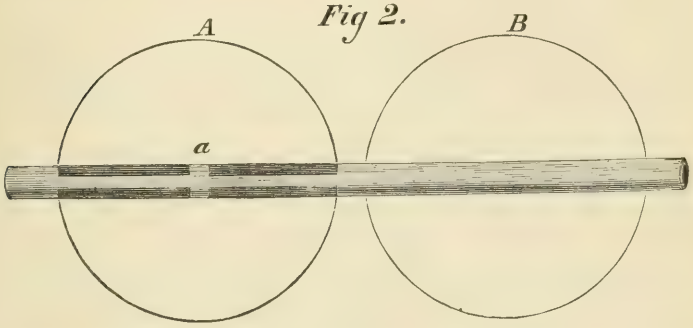
Of course it is impossible to imitate, artificially, the conditions of the human eye, but a very simple experiment is sufficient to illustrate the principle upon which I think the effect produced depends

For this purpose I used two small cylindric boxes, about three inches in length and one in diameter. These were fastened together longitudinally, like the tubes of an opera-glass. At the bottom of one of the tubes I placed a mirror made of

London smoke glass, silvered on the back. As the mirror was, in fact, an ophthalmoscopic mirror, there was a hole in the centre, which fact I mention for a purpose to be explained a little later.

At the bottom of the other cylinder I placed a non-reflecting surface. A thin glass tube, about a line in diameter, and containing a solution of water and carmine, was then run through the centre of both cylinders just in front of and nearly in contact with the mirror in the one and the non-reflecting surface in the other.

Fig 2.



We may thus consider that one of these cylinders (*A*, Fig. 2) represents, in a rough way, the fundus of the eye, in which the mirror is the retina, and the red glass tube a retinal vessel.

If now we cast the light, as in an ordinary ophthalmoscopic examination, down the cylinder containing the silvered mirror *A*, so that the light from the instrument shall fall directly upon the glass tube, we get the appearance along the centre of the tube of a light red streak, bordered above and below by a dark red line.

We see further, however, as we follow the light-streak along, that as soon as we arrive at the central point of the tube, or that portion which lies directly over the hole in the mirror, the light-streak disappears and is replaced by a small quadrangular patch (*a*, Fig. 2) of a uniform color, extending across the entire diameter of the tube.

If, however, we now look down the other cylinder (*B*), we

see that the tube, instead of presenting a light centre, with darker red border, as in *A*, is uniformly colored throughout.

It is manifest that if the light-streak seen in *A* is simply due to reflection from the wall of the tube, or from its contents, then we ought to get it also in *B*, as the tube is one and the same as that in *A*, and is seen, so far as it is itself concerned, under precisely the same conditions.

From this it follows that the difference in effect in the two cylinders must be owing to some conditions external to the tube. Now, the only difference in the conditions present, is the difference in the nature of the two surfaces at the bottom of the cylinders.

It is thus evident that the light streak in the centre of the tube in cylinder *A*, like that in the centre of the retinal vessel, is due to the same cause, namely, that the light passes through the tube, and is reflected back from the mirror beyond.

That the reflection does not take place from the posterior wall of the tube, or the posterior wall of the retinal vessel, but from the reflector beyond in the one case, and the tissues in the other, is proved from the fact that where the glass tube passes over the hole in the mirror, that is, where the reflecting surface behind is wanting, the light streak is also absent (see *a*, Fig. 2). This is evidently due to the fact that just where the hole is, the light, after having passed through the tube, does not strike upon the mirror, but passes through to the bottom of the box beyond, which, being of a non-reflecting nature, does not permit sufficient light to come back to the observer's eye to produce the light streak.

To see precisely the same effect on a larger scale, we have only to look down cylinder *B*, where the glass tube presents a uniform color throughout, for the reason just given above.

There are many interesting points in connection with this subject, both physiological and pathological, which I hope to discuss on some future occasion.

Ectropium, Exophthalmus, Extirpation, Plastic Operation.

By Henry D. Noyes, M. D., Surgeon to New York Eye and Ear Infirmary, etc.

In November, 1869, Miss Martha B., aged 16, living in Canada West, came under my charge at the New York Eye and Ear Infirmary. When an infant, about one year old, the upper lid of the left eye swelled, and, after nine days, matter was discharged, and continued to flow for a long time. After the expiration of two years a piece of bone was discharged, and small portions of bone were from time to time thrown out until she was ten years old. Then the orifice closed and has since so remained. At two years of age the upper lid began to be everted; from the very outset the eyeball advanced, and the ectropium and exophthalmus increased slowly, steadily, and simultaneously. The parents think the child was four or five years old before sight was affected. She has no recollection of pain in the organ.

The aspect of the parts is now as follows: The tarsal border of the upper lid is drawn upward and firmly attached to the orbital edge within $\frac{1}{8}$ of an inch of the eyebrow. The adhesions of upper lid have evidently undergone stretching, and permit more freedom of motion than at some previous time. A deep depression can be felt in passing the finger along the upper edge of the orbital opening, especially of the middle and outer portions. There has from this place been a considerable loss of bone. The lower lid is likewise pushed out of position, being everted and depressed, but not adherent. The lower orbital margin is marked by irregularities.

The eyeball is pushed forward and downward, the cornea looking downward and inward. At least two-thirds of the globe is exposed to view; so much is it shoved downward that the edge of the lower lid of this side is $\frac{5}{8}$ of an inch below the level of the lower lid of the other side. A line drawn horizontally across the nose from the lower lid of the right eye, strikes the diseased eye 3‴ above and behind the margin of the cornea. It will be seen that the globe is exposed to view at its upper part far behind the equator. The whole conjunctiva, palpebral, and ocular is exposed to view, and has

become thick, vascular, and insensible. It is constantly bathed in a viscid catarrhal secretion. Although insensible to some degree, the eye cannot long be left uncovered. The patient wears a patch over it by day, and at night covers it with her hand. The cornea, besides being opaque from pannus and infiltration, has almost completely lost sensibility.

The condition of this eye, sufficiently revolting and distressing in itself, renders the other eye uncomfortable, unable to bear the light or to fix a steady look. In the photographs

which were taken, the right eye is seen closed, because it was impossible for her to look at the camera. She likewise carries the head stooping forward.

In considering what was best to be done for the patient's relief, the cause of the exophthalmus became an interesting point. It might depend on hyperostosis in the orbit, concurrent with the early caries of its walls; it might be simply from thickening and hypertrophy of the connective tissue. No

hard bony mass could be felt, and the latter proved to be the actual cause. It was certain that the eyeball, after being so many years pushed forward, could not be returned to its place. The conjunctiva was in a hopelessly diseased condition, like extreme trachoma, and the cornea could never be expected to permit vision. It was therefore evident that, notwithstanding the eye possessed quick perception of light, and within was doubtless healthy, it would have to be extirpated, both for the sake of the other and to relieve deformity.

I therefore proceeded to the following operation: The globe was enucleated in the usual way. The attachment of the upper lid to the roof of the orbit was severed by a cut in the skin parallel to the tarsal edge, $\frac{3}{4}$ of an inch long, carried deep into the tissues until the lid was free. By pulling down the lid while dissecting its adhesions, the horizontal incision was made vertical when the lid was down to the fullest degree.

The next step was the removal of the whole conjunctiva, as well as the tarsal borders of both lids. This was a tedious

and bloody dissection. It was not needful to make any incision to bring the lower lid to its proper level. Having now liberated both eyelids from their attachments, and removed the eyeball and entire conjunctiva, the way was cleared for the final step in the object I had in view, which was to close in the orbital cavity, and seal it hermetically by a layer of skin. I desired to do this with as little deformity as possible, and succeeded by sliding flaps of skin horizontally from the temple and the inner angle of the eyelids. These flaps, which were quadrilateral, were made by incisions parallel to each other, running close under the brow, and from the outer commissure outward, and similar incisions running inward toward the nose. These portions of the skin were drawn toward each other and united by a vertical line of sutures, meeting at about the middle of the upper lid. Next the upper borders of the flaps were stitched to the undisturbed skin along the brow. It only remained to attach to each other the upper and lower lids, which had been deprived of their tarsal edges.

The plan was simple, and carried into effect without special difficulty. Of course many sutures were inserted, but there was no unpleasant tension of the flaps, which fitted nicely and entirely closed in the orbit, except at the middle of the lower line of union, where an opening was left for escape of fluids. A compress of picked lint and a bandage were applied.

Primary union took place, but on the third day erysipelas took place, and involved the whole side of the face. There was considerable fever and prostration, pulse reaching 120; the swelling, heat, and pain of the face distressing. The patient finally came through the struggle, the wounds closed properly, and by the end of five weeks she was well. She then presented the appearance exhibited in cut 3. It will be noticed that she freely opens her remaining eye, which was before impossible. Though her appearance after the benefits of surgery may not be considered attractive, yet it is far less repellant than before. To conceal the absence of the left eye, she wears a screen on that side. She returned to her home in Canada much pleased at the improvement, and enjoying a degree of comfort in the use of her right eye which she had not had within her remembrance.

New York, 73 Madison Avenue.

On the Treatment of Strabismus Convergens through the Accommodation. By John Green, M. D., of St. Louis, Missouri.

Starting from the well-known demonstration of Donders, that strabismus is generally dependent upon a displacement of the region (or exceptionally upon a restricted range*) of accommodation, and recognizing with him that the causes which, in hypermetropic individuals especially determine the development of convergent squint, are to be found in those conditions which either diminish the value of binocular vision, or increase the difficulty of maintaining a proper direction of the visual axes, I wish briefly to call attention to these latter conditions, with the view to the possible establishment of new indications for treatment.

The chief impediment in the way of maintaining a proper direction of the visual axes lies in the fact, that in distant vision, with parallel axes, the eyes are not only in a state of accommodative relaxation, but are also very nearly in the position of the greatest possible divergence. Any cause, therefore, which but slightly diminishes the effective power of the recti externi, may easily result in such a change in the region of mobility of the two eyes as to make it difficult, or even impossible, to maintain a parallel direction of the visual axes. Especially is this true of hypermetropic persons, in whom the range of divergence is originally less than normal, owing to the extraordinary magnitude of the angle which the visual axis makes to the axis of curvature of the cornea.

Chief among the causes which tend to diminish the effective power of the recti externi in hypermetropia, must be reckoned the exercise of the function of accommodation, which ordinarily is called into full play at about the age at which the first

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* Donders, in a paper appended to the decennial report of the Netherlands Ophthalmic Hospital (Utrecht, 1869), has called attention to the influence of a restricted range of accommodation as a cause of strabismus convergens in emmetropic eyes, thus correcting the opinion which he had earlier expressed, that "diminished energy or paresis of accommodation by itself is as little liable to produce strabismus as is the diminution of the range of accommodation connected with the increase of years." (Anomalies of Accommodation and Refraction, Sydenham edition, page 301.)

manifestations of strabismus are generally noticed. Every act of vision, whether for distant or near objects, not only calls for an accommodative effort, excessive as compared with that required of a normal eye, but at the same time tends to disturb the balance between the recti interni and externi muscles by inducing increased tension of the former and corresponding relaxation of the latter. That this disturbance of the balance between these two sets of muscles does not oftener give rise to diplopia, can only be explained by the instinctive dislike of double images, giving rise to an especial exercise of the will acting upon the same muscles in the opposite sense.

In the contest between these two opposite tendencies, viz., toward convergence incident to the effort to secure accurate accommodative adjustment, and divergence to avoid confusion from double images, it is possible that either may prevail. If through the dislike of double images the proper direction of the visual axes is perfectly maintained, accommodation will be effected with more or less difficulty, and the well-known symptoms of asthenopia may appear. If, on the other hand, the necessity for perfect vision leads to the maintenance of accurate accommodative adjustment, the over-taxed recti externi will often become wearied, then weakened, and finally, in the presence of the fact that divergent efforts have become unavailing, may yield altogether. Thus the habit is formed of squinting in connection with severe or protracted exercise of the accommodation, a habit which tends rapidly to develop into permanent strabismus, with ultimate shortening of the recti interni, and corresponding elongation of the externi.

In this contest between the accommodative system, striving after distinct definition, and the recti externi, laboring to maintain single vision with the two eyes, it is possible to intervene by art, so as to restore the balance between the opposing forces. This we may effect in several ways. Thus we may assist either the accommodative organs or the recti externi muscles by permanently relieving them of a part of their work, in the former case by convex, in the latter by prismatic glasses. Or again, we may try to strengthen the weak or overtaxed organs by carefully regulated exercise, in the one case by the aid of convex glasses gradually exchanged for

weaker; in the other by prisms similarly changed as their influence upon the muscles becomes manifest. Thirdly, we may act directly upon the recti interni muscles by a tenotomy, and thus indirectly aid the externi by weakening their antagonist. Fourthly, we may suppress the consentaneous action of the recti muscles with the organs of accommodation by suppressing accommodation itself through the action of atropia.*

All these plans may prove efficient in cases both of asthenopia and of muscular insufficiency or of deviation, and they may often be combined with advantage. Thus we may effect more by the use of prisms with convex surfaces than by simple convex glasses or plain prisms. So also we find use both for spherical glasses and prisms in the course of treatment after tenotomy, as well as in preparing for the operation. Lastly, we may use atropia for the purpose of creating an artificial amblyopia, necessitating the use of convex glasses, and so compel a child to wear and use them, when, without the aid of the atropia, they would be rejected.

I desire now to ask attention to some of the uses of atropia in the treatment of strabismus convergens, as well in the incipient or periodic stage of the affection, as in those cases in which the deviation tends to reappear after having been temporarily cured by tenotomy.

This application of atropia is based upon the consideration that by its agency we may, for the time, completely suppress the function of accommodation, so that all accommodative efforts, even when associated with the highest degrees of convergence, are rendered powerless to increase the distinctness of vision. Under these conditions the patient soon discovers the fruitlessness of all such efforts, and consequently desists

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* In the rare cases, lately described by Donders, of strabismus convergens dependent on restricted range of accommodation in emmetropic individuals, there may be an indication for the employment of the Calabar bean. We might even expect to obtain a temporary effect from this agent in certain cases of strabismus dependent on hypermetropia; for under the accommodative spasm thus artificially induced, it is quite possible that the correlation between accommodation and convergence may be, for the moment, perfectly restored. We can hardly expect, however, as a rule, to obtain useful practical results from this agent, owing to the symptoms of irritation which attend its prolonged use.

from them altogether. Thus the principal motive to excessive convergence is taken away, while the motive to accurate direction of the visual axes, growing out of the dislike of double images, is left to act without opposition.

The theory of this plan of treatment is a natural development from certain facts observed by Donders, and recorded in his great work on *The Anomalies of Accommodation and Refraction of the Eye.*

"In general it is not the highest degrees of hypermetropia with which strabismus is combined. Often even, at least in young persons, the hypermetropia is completely latent." (Syd. ed., p. 293.)

"In the highest degrees of hypermetropia, strabismus is rarely observed This need not surprise us. In such cases the power of accommodation is, even under abnormally increased convergence, not sufficient to produce accurate images, and such hypermetropes are thus led rather to the practice of forming correct ideas from imperfect retinal images than of, by a maximum of tension, improving the retinal images as much as possible." (Syd. ed., p. 301.)

Adopting the explanation of Donders, that the highest grades of hypermetropia but rarely give rise to strabismus, because "in such cases the power of accommodation is, even under abnormally increased convergence, not sufficient to produce accurate images," the question naturally arises whether, by artificially producing a similar inability to form accurate retinal images, we may not, to a considerable extent, overcome the tendency to squinting in hypermetropic persons, and, in cases of strabismus still in the periodic stage, arrest the further progress of the deformity.

The history of the following cases would seem to answer this question in the affirmative.

Case I. Anne H., 12 years old, has had convergent strabismus for eight years, the right eye deviating now about four and a half lines. The tendons of both recti muscles were divided, October 13, 1869, with the result, apparently, of perfectly correcting the position of the visual axes. Three weeks after the operation she complained of seeing double whenever she looked intently upon any object, and, on examination, a slight deviation of the right eye during fixation, with homonymous diplopia, was detected. Three days later a conspicuous periodic squint of about a line and a half had developed itself. A solution of atropia (gr. iv(ą ʒi) was ordered, to be used three times a day in both eyes. Forty-eight hours after commencing the use of the atropia, she was seen again, entirely relieved of the diplopia, and manifesting no sign of deviation. Examination with glasses revealed a total hypermetropia of $\frac{1}{12}$. The effect of the atropia was allowed to pass off, and when next seen, two days

later, she again complained of diplopia, and again manifested slight convergence during fixation of a distant object. The use of the atropia was now resumed, and continued twice a day for a week, with the result of again removing both the diplopia and the deviation of the visual axes. The child now complaining of inability to see distinctly at short distances, was allowed to wear convex glasses of $\frac{1}{6}$, and to go to school, still using the atropia once a day. The case continued to progress satisfactorily for two months, dating from the day of the operation, when its history was suddenly concluded by the removal of the child to California.

The points illustrated by this case are the efficiency of atropia to control the action of the recti muscles as associated with the exercise of the function of accommodation, and so to arrest the tendency to a return of the squint; also the creation and maintenance of an artificial amblyopia, compelling the use of convex glasses by a child who otherwise would hardly have been induced to wear them.

Case II. May 19, 1870. Blanche M'C., 5 years and 9 months old, has periodic strabismus convergens of the left eye, amounting to about two lines. When she gazes vacantly around, the eyes seem to be perfectly straight, but the deviation appears so soon as she attempts to look intently at any object, whether near or distant. She is able to fix objects with either eye, although, as a general rule, the squint appears in the left eye. The first appearance of squint was noticed about three years ago, and it is said to have developed to its present degree in about a month.

As the squint evidently occurred only in connection with efforts at accommodation, atropia was used freely for twenty-four hours, in the hope that by suppressing the function of accommodation, the consentaneous convergence might also be controlled. The next day it was noticed by the mother and other members of the family, that the deviation occurred much less frequently, and continued for a much shorter time than before. Examination with glasses showed a total hypermetropia of $\frac{1}{9}$ in both eyes, vision being $\frac{16}{25}$ in the right eye, and $\frac{16}{64}$ in the left.

A solution of atropia (gr. ij@ʒi) was ordered, to be used in both eyes twice a day, with a view both to its still further action in breaking up the habit of excessive convergence, and to the creation of a necessity for the neutralizing convex glasses, which were also ordered. Four days later the mother reported still further improvement, and expressed great surprise at the fact that the child could not be persuaded to go without the glasses. Eleven days after the commencement of the treatment by atropia, the mother writes that "the eyes continue perfectly straight," and that for several days, during which the glasses had been lost, the child "would draw the lids of the eyes together when she wanted to look at an object, a habit which is, however, entirely done away with by resuming the use of the glasses." At this time the vial of drops was broken, and a week elapsed before more could be procured. During this time the eyes continued straight under the influence of the glasses, excepting that on a single occasion, when she neglected to put them on in the morning, she

was noticed to squint, the eyes becoming straight, however, as soon as she resumed the glasses.

At the end of two months from the first employment of the atropine, the mother writes that "the eyes become crossed with the glasses on if the drops are discontinued a week; if the drops are used twice a week, the eyes remain perfectly straight with the glasses, but the drops must be used every second day to keep them straight without the glasses." A stronger pair of glasses was now ordered, for occasional use in learning to read.

This case teaches that by the occasional use of atropia alone (a solution of gr. ij ad. ℥i, dropped into the eyes every second day), a periodic squint of tolerably long standing may be entirely corrected; secondly, that by combining the use of atropia with the wearing of neutralizing convex glasses, a longer interval may be allowed between the successive instillations of the same solution; thirdly, that atropia may prove effective in controlling a squint when convex glasses alone are insufficient or inapplicable.

The conjoined employment of atropia with neutralizing convex glasses is to be continued for several months, in the hope that the case may finally be brought fully under the control either of convex glasses or of prisms with convex surfaces.

Case III. June 21, 1870. John S., 13 years old, has had interstitial keratitis (with notched incisor teeth) for four months; has had no intelligent treatment. Corrosive sublimate was prescribed, $\frac{1}{36}$ grain three times a day in solution. Nine days later both corneæ had become clearer, and for the first time he complained of double vision, with homonymous images two feet apart at a distance of sixteen feet. The right eye appeared to be the deviating one. Both eyes were brought fully under the influence of atropia, and the refraction tested the following day—Ht.=$\frac{1}{10}$, V=$\frac{14}{15}$. visual axes parallel, no diplopia. Atropia solution was ordered (gr. ij@℥i), to be used twice a day. After using it a week, the vial was overturned, and the remedy omitted for three or four days. The pupils were now found to be considerably contracted, and the diplopia had returned with a rather conspicuous periodic squint. Both squint and diplopia yielded within an hour to the repeated instillation of atropia, and have since been kept perfectly under control by the same means. Glasses have not been used, except to measure the refraction. The corneæ are gradually becoming clear, and the disease of that tissue is evidently fast yielding to treatment. (Sept. 19, 1870.)

This case is an illustration of incipient strabismus dependent on hypermetropia, but first developed through the operation of a cause which diminished the value of binocular vision.

During the active period of the disease of the cornea, vision was probably so imperfect as to preclude much effort to see anything distinctly. The tendency to excessive convergence remained latent, therefore, until the condition of the left eye had so far improved as to awaken the dormant accommodation. Meanwhile, in consequence of the still obscured state of the centre of the right cornea, no positive and well-defined diplopia could arise, but only a vague sense of confused vision, too indefinite to oppose an effective obstacle to the abnormal tension of the recti interni.

The effect of the treatment by atropia in this case appears to have been twofold. By enlarging the pupil of the right eye, it brought into use the clear marginal zone of cornea, and so enabled this eye to take part almost equally with the other in vision; secondly, by suppressing the function of accommodation, and with it the consentaneous action of the recti, it permitted the maintenance of a proper direction of the visual axes during the rather tedious progress of the diseased corneæ toward the recovery of their dioptric functions.

A case of strabismus convergens temporarily disappearing, on artificial mydriasis of the sharp-sighted eye is mentioned casually by Donders as a curiosity. (Syd. ed., p. 299.) On another page (305, note), the same author, advising the daily exercise of the deviating eye, remarks that "mydriasis, by atropia, of the eye which is usually properly directed, immediately causes the other to be used, and is therefore sometimes recommended in the case of young squinting children upon whom it is undesirable as yet to operate." The knowledge of these isolated facts, thus inadequately interpreted, seems, however, to have remained barren of practical results.*

The efficiency of atropia, used to the extent of suppressing the function of accommodation, to control also the consenta-

* It is a curious fact that the occasional utility in strabismus of a convex glass worn before the non-deviating eye was known to Buffon more than a century before Donders enunciated the law of causation of the disease, and, curiously enough, he explained its effect in precisely the same way in which Donders has explained the possible usefulness of atropia, viz., by attributing it to the artificial amblyopia in the sharp-seeing eye favoring the exercise of the other. (Dissertation sur la Cause du Strabisme; Mémoires de l'Académie Royale des Sciences pour 1743, p. 338; Amsterdam, 1748—quoted by Mackenzie.)

neous action of the recti muscles, and so to take away the principal motive, in hypermetropia, to excessive convergence, may be considered as established. Of its practical utility in the treatment of incipient squint, and of the returning deviation after an apparently sufficient tenotomy, there can also be but little doubt. In confirmed convergent squint, too, it may often render important service, by suppressing so much of the deviation as is still due to perverted muscular action, and so reducing the deformity to a minimum representing the degree of actual alteration of the tissues; thus it may aid the surgeon in estimating beforehand the degree of adjustment to be sought from a tenotomy, and afford a safeguard against the accident of an over-correction. The good effect of a course of training with neutralizing convex glasses, preliminary to any operation upon the interni muscles, has been already clearly and forcibly stated by Loring (Trans. Am. Oph. Soc'y, 1869, pp. 32–3), but the method is hardly applicable to young children, and in adults may demand more time than patients are willing or able to devote to it. The employment of atropia in such cases may enable us oftener to make a thorough analysis of the symptoms, and so may occasionally save us from a serious blunder in treatment.*

In treating strabismus by tenotomy, we are but too apt to assume that, having rectified the position of the eyes by the operation, it only remains to correct the refractive defect by neutralizing glasses. That this is a grave error has been clearly pointed out by Loring (Trans. Am. Oph. Soc'y, 1869, p. 32), who has shown that the indication for glasses cannot be founded upon even the most exact measurement of the state of refraction, but only upon "data furnished after the operation from a careful study of the relative accommodation, both for the far and near." This is, in fact, just what we ought to ex-

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* In certain cases of insufficiency of the recti interni, and relative strabismus divergens, there would seem also to be an indication for the use of atropia, in order that, by the suppression of accommodation, the point of most distinct binocular vision may be fixed at the absolute far point of the myopic eye, instead of at some shorter distance. In the higher grades of myopia, the accommodation is so small as to make its temporary suppression a matter of very little consequence.

pect when we consider how rude is the adjustment which we can hope to effect by setting back the tendons of the recti muscles; it accords perfectly, too, with the common experience, that certain hypermetropic patients obstinately refuse to wear convex glasses after tenotomy, and actually enjoy good vision, both for the far and for the near, without them. Such a case I have observed within a few weeks in a boy of twelve years (Ht.=$\frac{1}{1\frac{1}{2}}$), upon whom I set back both recti interni about six months ago. He reads easily and enjoys binocular vision, as I have proved by stereoscopic tests, yet he has laid aside as an encumbrance the glasses which I gave him immediately after the operation. In this case I infer that I have really over-corrected the deviation, so that a certain effort of the interni is required to prevent divergence in distant vision, thus restoring, approximately, the normal relation between accommodation and convergence. Comparing this case with others in which binocular vision could be maintained only by the aid of neutralizing convex glasses, I am led to extend the indication for glasses beyond the limits at present recognized, for it is easy to conceive of cases of over-correction, in young persons with great range of accommodation, in which it may be necessary to prescribe even concave glasses, while in other cases, of slight under-correction, it may be advisable to insist on the use, for a time, at least, of convex glasses which shall over-correct the hypermetropia, and render the patient practically myopic—giving him, perhaps, for the distance, neutralizing glasses decentred sufficiently to admit of single vision.*

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* In the treatment of muscular asthenopia and slight degrees of muscular insufficiency, by the aid of prismatic or decentred spherical glasses, I am in the habit of ordering them mounted in circular frames, so as to admit of a gradual reduction of their prismatic effect, as regards the interni and externi muscles, by turning them, from time to time, as the weakened muscles become stronger from use.

Remarks on some Practical Points concerning Cataract Extraction. By Dr. H. Knapp.

By personal intercourse with members of the profession and the perusal of the American medical press, I learn that in this country a greater divergence of opinion than there should be, still exists with regard to the best modes of cataract operation. I am, you know, an advocate of Græfe's peripheric linear extraction, which I continue to practise with results more satisfactory than I obtained by any method I practised in former years. In the hope of encouraging an exchange of opinion, I beg, Mr. President, to make some remarks on Græfe's method of extraction, which have been suggested principally by the experience derived from the operations I performed in New York.

During the last fourteen months, I have made, at the New York Ophthalmic and Aural Institute, 27 extractions. Two of them were complete failures, the one by suppuration of the flap, the other by purulent iritis. The operations in both these cases had been unexceptionable. The remaining twenty-five cases were complete successes, no so-called half or moderate success having occurred.

With regard to the *form of the knife*, I prefer instruments with *blades as narrow as possible*. They are better adapted to the execution of a linear section than broader instruments, and can be pushed with facility through the anterior chamber, allowing of a partial withdrawal, if their point become engaged in the iris, or the counterpuncture be made not exactly where it should be. Those who lay more stress upon the peripheral position than on the linear direction of the wound, may just as well choose instruments with larger blades, of which every variety, between Græfe's and Beer's knives, has been fabricated and met with local favor.

The *sharpness of the cutting edge* is of the greatest importance in obtaining a regular and smooth section. The section should be executed completely by a single forward and backward movement of the knife. Every additional motion is sawing, which renders the section angular, its surface uneven, and causes more or less unnecessary traction and bruising. It

seems to be more difficult to render a narrow blade perfectly sharp than a broad one. I have given this point particular attention, and find that blades with convex surfaces, as in Beer's knives, are the worst of all. Instruments with plain surfaces may cut well enough, but the best cutting-edge is obtained by making the surfaces of the cataract knife concave, like those of a razor. This I knew long ago, but thought that the narrowness of our instrument would be an obstacle, and so, also, I was told by several makers. Lately, however, Messrs. Otto & Reynders, of New York, have made some cataract knives for me which are sharper than any I had ever before used. At my request, they have kindly given me some of them for presentation and distribution in this society, in order that these knives may be more extensively tried.

With regard to the *extent* and *position of the section*, I have often observed that tyros in this operation commonly make the section too small, which leads to very serious consequences, viz., difficult and unclean removal of the lens, bruising of the iris and cornea, prolapse of the vitreous, etc. Many, also, in order to avoid the cornea, place the wound too peripherically, lose vitreous, and provoke iritic and cyclitic processes. It would be preferable to place the middle of the wound entirely into the cornea, as some operators are accustomed to do, for this makes the procedure extremely easy, and is hardly ever followed by prolapse of vitreous. I make the section so that its middle lies between the tangent of the transparent margin of the cornea and a point 1 mm. distant from it. This, with some experience, affords a faultless execution of the section, and does not expose us to the dangers of a corneal wound.

The *laceration of the capsule* I effect in the following manner: After careful excision of the iris, I introduce the cystitome as far as the opposite border of the pupil, turn its point toward the capsule, and open the latter along the margin of the pupil, and along one side of the coloboma up to the corresponding angle of the wound, then turning the instrument on its flat side, I push it forward again to the opposite margin of the pupil, slit the capsule along the other margin of the coloboma and the periphery of the cataract near the section. Then, in ordinary cases, I withdraw the instrument; but when

the capsule is tough, I carry the cystitome again as far as the central point of the opposite pupillary border, rotate it about 45 degrees on its axis, seize the circumcised piece of capsule, and endeavor to draw it out with the point of the cystitome. I do not like to introduce the point of the cystitome beyond the visible limits of the pupil, behind the iris, as A. Weber and A. Von Græfe do, since I consider the just described mode of lacerating the capsule quite sufficient, and think that it is prudent to come as little as possible in contact with the iris. When the capsule is thickened in the centre, as is often the case in hypermature cataracts, I circumcise this thickened *plaque* in a similar way, as above described, and try to extract it with the cystitome. If this prove unsuccessful, I extract the circumcised thickened piece of capsule with a delicate pair of iris forceps. In this way that piece of the anterior capsule which is situate in the pupil is removed with the cataract in at least four-fifths of the cases, as those will testify who witnessed my operations. I always laid great stress on the removal of the anterior capsule, being convinced that thereby one of the principal causes of inflammatory reaction and opacification in the pupillary space is eliminated.

The careful opening of the capsule being of the greatest importance, no blood must be allowed to collect in the anterior chamber, as it would mask the point of the cystitome and render the rather delicate manœuvre uncertain. Hemorrhage into the anterior chamber occurs sometimes immediately after the corneo-sclerotic section, but more frequently after the excision of the iris. No attempt need be made to stop it, but the evacuation of the blood in the anterior chamber should be effected as soon as the excision of the iris is completed. Ordinarily I succeed in getting rid of the blood by pressing upon the cornea with a small piece of very soft wet sponge. If this fails, I take away the fixation forceps and lid-speculum, and press the blood out by rubbing the lower lid over the cornea, while, at the same time, depressing the posterior lip of the wound with the upper lid. After that I re-apply the speculum and fixation forceps, and proceed in the operation as if no hemorrhage had taken place.

In effecting the expulsion of the lens, I take care that the

corticalis comes out, together with the nucleus, so that one movement of the spoon from the lower part of the cornea up to the centre of the wound removes the cataract completely. To render this possible, in cataracts with soft corticalis, I do not materially lessen the extent of the section, as I did formerly, when I brought the soft remnants out by rubbing of the cornea with the lower lid. This latter method of removing the "afterbirth" certainly clears the pupil, but my recent experience has made me suspect that it might prove prejudicial to the healing of the wound. In the few cases which I lost by suppuration of the flap, extensive rubbing had been resorted to; and to this manipulation alone could I ascribe the suppuration. But, Mr. President, we must not forget that the remote and proximate causes of the suppuration of the flap have always been a mystery, baffling, not infrequently, our most confident hopes after the smoothest operations.

In conclusion, Mr. President, allow me to make some remarks on the manner of *dressing eyes* after the operation. At the last meeting of this society, Dr. C. R. Agnew described a new mode of dressing (see Transactions of Sixth Annual Meeting), "which should be allowed to remain upon the eyes until the afternoon of the fourth or fifth day." On this point I disagree with the doctor. His dressing is very neat, and must be comfortable to the patient, but is open to all the objections that are made to permanent dressings after cataract extraction. One of the earliest and most frequent among the unfavorable reactive processes after extraction is iritis, which, when left unchecked, always obscures the pupil more or less, and may even completely frustrate a good result. Traumatic iritis should certainly be treated as early and with the same means as spontaneous iritis. I think, therefore, Mr. President, every mode of permanent dressing objectionable, whatever its advantages may be. The application of Dr. Agnew's dressing requires too much time to renew it twice daily, as should be done. In addition to iritis, there are many other abnormal conditions which may disturb the healing process. Sometimes I have removed the bandage six hours after the operation, the patient complaining of heat and pain in the eye, and have found the lids œdematous. On opening them, a stream of hot

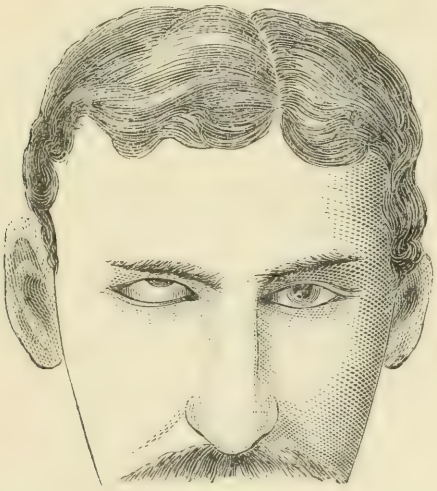
tears ran down the cheek; the eyeball was not much injected, not chemotic, and the wound well closed. Then I felt relieved, being assured that only the retention of the tears by anxious and spasmodic closure of the lids caused the disturbance. I put a drop of atropine into the eye, bandaged it again, and the patient had no further unpleasant feeling. These cases healed well. The condition of the wound should always be cautiously inspected once every twenty-four hours from the second day after operation, to see whether there is any prolapse of iris or vitreous, or a remnant of lens or capsule, or an inverted piece of conjunctiva, or the intrusion of a foreign body—for instance, a cilium—to prevent perfect closure. All these accidents I have seen, and more may occur; and all, if seen on the second day, can be removed before they have exercised a detrimental or fatal influence on the eye. There are eyes which do not bear occlusion for some days without becoming affected with a lower or higher degree of conjunctivitis. I have seen that eyes, even if bandaged, and cleaned twice a day, had their conjunctiva so much swollen, and secreted such a quantity of pus,—cornea, iris, and wound being in perfectly normal condition,—that I was obliged to touch the conjunctiva of both lids with a one to two per cent. solution (5 to 10 grains to the ounce) of nitrate of silver, and leave the eyes uncovered altogether from the fourth day. Under this treatment they healed well, and as speedily as if the complication with blennorrhœa had not occurred. I think, Mr. President, these facts are sufficient to recommend a mode of dressing which can be easily applied and removed. Dressings remaining on the eye for from three to six days may have some advantage in badly closing flap operations, but the lips of a linear section have so great a tendency to exact adaptation, that a compressive and permanent bandage can be dispensed with, and the eyes may be opened, cleaned, treated with atropine and other remedies, without fear, and even may be daily inspected with impunity by "a peeping pathologist."

A Contribution to the Subject of Strabismus. By C. R. Agnew, M. D.

T. S., aged 23, had his right eye operated upon for convergent squint at the age of eleven years. I first saw him at the age of seventeen. He stated that after the operation the eye began to turn upward and outward, until finally the cornea was nearly buried behind the outer half of the upper eyelid, thus exposing a wide expanse of sclerotic and producing a remarkable deformity. An attempt to fix with this eye alone, the other eye being closed, enabled him to bring the cornea down to the centre, but not below it, and to adduct it so as to make its nasal margin coincide with the median vertical line of the palpebral opening. Over the nasal aspect of the eyeball there was a continuous and somewhat roughened scar, as though the tendons of the internal and inferior recti had been both cut in the attempt to correct the original convergence. Having satisfied myself of these features of the case, I endeavored to cure the deformity by dividing the superior and external recti. This lessened the deformity, increasing the converging power and bringing more of the cornea into view. The case then passed from under my observation for six years, returning in the Spring of 1870. At this time there was a conspicuous upward squint, as shown by the following illustration.

The vision at this time was in R. E., with $-\frac{1}{13}$c axis horizontal $= \frac{2}{3}$ in L. E. with $-\frac{1}{30}$c axis horizontal $= 1$. No lesion of the fundus, except slight atrophy of the choroid around the temporal edge of the optic disk. I attempted to correct the deformity by advancing the inferior rectus of the right eye, contemporaneously cutting both superior recti. I found the advancement of the inferior rectus somewhat embarrassed by the old scars, but succeeded in accomplishing the necessary steps by the following method. I lifted the scleral conjunctiva with forceps placed over the nasal end of the normal insertion of the inferior rectus, and then with delicately probe-pointed scissors cut through the conjunctiva and fibrous capsule along the inner border of the muscle to a point corresponding with the bottom of the conjunctival *cul de sac*. I then made a simi-

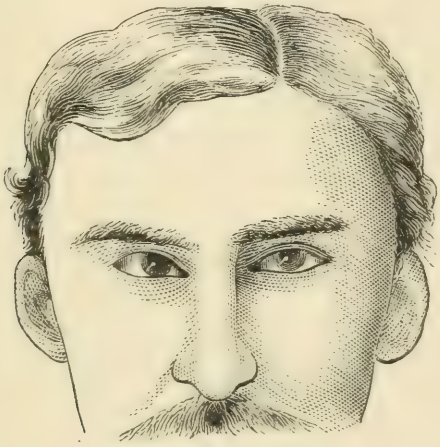
lar incision along the line of the outer border of the muscle. I then passed a strabismus hook, with an eye drilled in its free end and armed with a ligature, behind the inferior rectus, grazing the sclerotic closely, and far enough back to catch any possible adhesion, and tied the mass, including conjunctiva, fibrous capsule, and tendon, firmly, close up to the line of sclerotic implantation. Drawing the eyeball downward, by means of the ligature, I then divided the superior rectus carefully and thoroughly, making the incision down upon the median line of the muscle in the direction of its course and beginning a line and a half from the edge of the cornea and extending backward



toward the *cul de sac* about four lines, I thus avoided the vessels running to the limbus and diminished the possibility of injury of the cornea from impoverished nutrition. The rectus is reached as easily through a wound in the course of its tendon as through one parallel with the corneal margin, and the danger of cutting off the blood supply of the cornea is removed. I always follow this method in cases of advancement of a rectus, and to it attribute, in part, the fact that I have never seen sloughing of the cornea, which seems to be a not uncommon occurrence under other methods. Having also divided, through a similar wound, the superior rectus of the fellow-eye, I dis-

sected the flap, including conjunctiva, capsule, and tendon, from the sclerotic, searching for any abnormal adhesions. While making this dissection I drew upon the ligature, cutting between it and the sclerotic, so that I had a firm hold upon all the tissues that I proposed to advance. I believe that the use of the ligature is of great importance, simplifying the operation, and giving you entire and easy command of the flap without the necessity of the free and repeated use of forceps. The next step was to place the sutures to advance the muscle. This was done by using small curved needles with Sand's needle-holder and waxed silk sutures. I used two sutures, one for each side of the flap, passing them through its base in the *cul de sac* and at a distance of about a line and a half from the free edges. Then drawing the eyeball downward as strongly as possible, by catching the conjunctiva near the cornea and stretching the flap by drawing it upward, I passed the suture from the inner edge of the flap beneath the conjunctiva over the line of insertion of the internal rectus, and emerging at a point corresponding with the inner terminus of the horizontal meridian of the cornea, left it to be tied after the outer suture had been planted. I then placed the outer suture in a similar manner through the temporal aspect of the conjunctiva, and drawing the eyeball strongly downward, gradually tightened, first one suture, and then the other, balancing the traction until the cornea was carried strongly downward and somewhat inward. The free end of the flap, including the part grasped by the ligature, was then cut off. After the operation the patient was kept quiet, and when reaction occurred, cold-water dressings were applied. Considerable chemosis ensued, obscuring for a few days the cornea, but I did not cut the sutures or interfere actively beyond the use of cold water and a few doses of codeine. I removed the outer suture at the end of ten days, and the inner at the end of three weeks, or not until they had nearly cut themselves out. I have, in cases of advancement of the internal rectus, usually delayed the removal of the sutures until they had nearly cut themselves out, thinking by this delay to insure a little more hypertrophy of the tissues involved and a consequent increase in the adduction as the cicatrices contracted. I have never seen any harmful inflammation following this

operation, or the slightest ulceration of the cornea. As the result of the operation, after all inflammation had disappeared, the cornea was brought down to appear in the palpebral aperture when the fellow-eye was fixed, but still some upward squint remained. Accordingly, on the 7th of July I made another very free tenotomy of the right superior rectus, at this time making an incision in the common manner over the line of insertion. On the 14th of July the photograph was taken, from which the following wood-cut was derived.



Thus, after a good deal of embarrassment the deformity consequent upon the original operation for convergent squint has been in great degree corrected, and a line of convergent squint left. A novice should be very careful, in operating for convergent squint, not to rotate the eyeball on its antero-posterior axis while dipping with his hook for the internal rectus tendon, or he may lose his reckoning and make a broader cutting than he thinks.

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

EIGHTH ANNUAL MEETING.

Newport, July, 1871.

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MEMBERS

OF THE

American Ophthalmological Society.

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Dr. E. Williams	"	"
Dr. Henry W. Williams	Boston,	Massachusetts.

Total 51

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Dr. E. Reynolds	"	"
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Dr. George Wilkes	New York,	New York.

Total 7

Whole Number 58

AMERICAN

Ophthalmological Society.

NEWPORT, *July* 20, 1871.

The Society met at the Ocean House, at 10 A. M., and was called to order by the President, Dr. H. W. WILLIAMS.—Present:

Dr. C. R. AGNEW	New York.
" F. DELAFIELD	"
" O. D. POMEROY	"
" E. G. LORING	"
" EDWARD CURTIS	"
" WM. F. NORRIS	"
" H. D. NOYES	Philadelphia.
" WM. THOMSON	"
" E. DYER	"
" G. HAY	Boston.
" B. J. JEFFRIES	"
" O. F. WADSWORTH	"
" H. G. NEWTON	Brooklyn.
" JOHN GREEN	St. Louis.

Minutes of the session of the last day of the last meeting read and approved. The President appointed a Business Committee to prepare a bulletin, and to select the topic of discussion for next meeting, consisting of Drs. Agnew and Thomson.

He also appointed a Nominating Committee, consisting of Drs. Loring, Wadsworth, Norris, Green, and Pomeroy. The Secretary presented the resignation of Dr. Robert Watts,

of New York, which was accepted. The Nominating Committee reported for election as active members:

Dr. George Strawbridge . .	Philadelphia.
" Charles S. Bull . . .	New York.
" Edwin Hutchinson . .	Utica.
" Richard H. Derby . .	New York.

All of whom were elected.

The Business Committee then reported the bulletin, which was taken up for consideration:

1. Remarks on cataract, by Dr. Loring. A pair of cataract-glasses was shown, in which a cylindric and a spherical surface were united by a novel method.

2. A case of congenital fissure of the lids, by Dr. Seely, of Cincinnati.

3. A case of congenital absence of both eyeballs, by Dr. George Strawbridge, of Philadelphia.

In reference to the question of how much effect in the production of congenital deformities is to be ascribed to impressions made on the mind of the mother during pregnancy, Dr. Agnew reported a case of a child born with staphyloma of the cornea, whose mother during pregnancy had been greatly disturbed by seeing, in Dr. Agnew's office, a patient having staphyloma of the cornea. Dr. Norris reported a case of congenital absence of the prepuce in a child whose mother during pregnancy had witnessed the operation of circumcision.

4. Sloughing of the cornea following paralysis of the trigeminal nerve, by Dr. Norris, of Philadelphia. Dr. Noyes related several cases which he had observed, and alluded to a report which he had recently made of some of them in the *New York Medical Journal.*

5. Dr. Jeffries read by title the report on ophthalmology, and reported also cases of herpes zoster ophthalmicus.

6. Two cases of general syphilitic inflammation of the eye, by Dr. F. Delafield, of New York, with morbid specimens.

7. Report of Passavant's operations, with and without ether, and also under nitrous-oxide gas, by Dr. Jeffries. Dr. Noyes related cases of the operation, in most instances with

success—in a few cases with relapses. Dr. Noyes was in the habit of using nitrous-oxide gas for minor operations on and about the eye.

8. An additional method for testing cases of astigmatism, by Dr. Strawbridge, of Philadelphia.

Dr. Green remarked upon the delicacy and value of the diagram described, but denied that it was new. He had used and exhibited similar figures, to be viewed, like this one, by transmitted light, and had made other diagrams on the same principle, some of which other members of the Society had also employed.

9. Variety of forms of astigmatic pencils, by Dr. Hay.

10. Ophthalmoscopic signs in asthenopia, by Dr. Loring, with drawings of alterations in the fundus oculi.

11. An apparatus for cutting microscopic sections of eyes, by Dr. Edward Curtis, of New York, with many specimens mounted for study under the microscope, which were examined by the Society. The papers were referred to the Publishing Committee.

On motion, adjourned.

EVENING SESSION, AT HALF-PAST SEVEN O'CLOCK.

President in the chair. Minutes of the previous meeting read and approved.

The Treasurer read his report, which was referred to an Auditing Committee, consisting of Drs. Dyer and Jeffries.

The bulletin was then resumed.

12. A case of readjustment of the levator palpebræ superioris, by Dr. Green.

13. Astigmatism from old corneal disease, treated by cylindrical glasses. Dr. Green.

14. Astigmatism as a cause of myopia. Dr. Green.

15. Experiences with the use of atropia in the treatment of strabismus. Dr. Green.

16. Remarks on Sämisch's method of treating ulcus corneæ serpens, by Dr. Noyes.

17. Description of a Jaeger's ophthalmoscope, modified by Dr. Strawbridge.

Papers referred to Publishing Committee.

On motion, adjourned.

July 21, 1871.

Society met at 9½ A. M. The President in the chair. Minutes of previous meeting read and approved. Dr. Jeffries offered the following resolutions, which were adopted:

Resolved, That the Committee of Publication be directed not to print any communication unless it has been presented in person by the author at the annual meeting, except it shall have been accompanied by explanations of his non-attendance which shall be satisfactory to the Society.

Resolved, That the Secretary be directed to communicate this vote to the members of the Society before January, 1872.

The Auditing Committee reported the Treasurer's account correct and properly vouched for.

The Secretary moved that the resolution, adopted for two years past, relating to papers to be sent to the Publishing Committee, be reënacted, and that the date of reception of papers be September 1st. Adopted.

The bulletin was next in order.

18. On the tables given by Loring and by Knapp to show the amount of displacement of the retina in ametropia, by Dr. Wadsworth.

19. The halo seen around the macula lutea, illustrated by an apparatus, by Dr. Loring.

20. A scheme for recording cases of asthenopia, and a disk to aid in testing perception of color, by Dr. Noyes.

21. Cases of hemiopia, by Dr. Thomson.

22. The retina an asymmetrical surface, by Dr. Murdoch, of Baltimore; the paper read by Dr. Agnew. Dr. Hay made remarks in criticism of the paper, which he was requested to put in writing for the Publishing Committee, and to send a copy to Dr. Murdoch, who was absent from the meeting.

23. Cases of soft cataract, treated by discission, by Dr. Agnew; read by title.

24. A peculiar case of sub-retinal effusion, by Dr. Noyes.

The above papers all referred to the Publishing Committee.

The Nominating Committee then reported for reëlection the same officers as for the last year, viz.:

President, Dr. H. W. Williams, of Boston.

Vice-President, Dr. C. R. Agnew, of New York.

Recording Secretary and Treasurer, Dr. Henry D. Noyes, of New York.

Corresponding Secretary, Dr. H. Althof, of New York.

Committee on Progress of Ophthalmology, Dr. B. J. Jeffries, of Boston.

Publishing Committee, Drs. Loring, Roosa, and Noyes.

All of whom were duly elected.

The place of meeting to be either Niagara or Newport, the latter was chosen by a vote of eight to three. The time of meeting to be the third Thursday in July.

It was voted that the assessment for the ensuing year be ten dollars, and that the Publishing Committee be authorized to call for an additional assessment if necessary.

After reading the minutes, on motion, adjourned.

Henry D. Noyes, M. D.,
Recording Secretary.

IN MEMORY OF

ALBRECHT VON GRAEFE,

Whose life and work so greatly helped to turn a doubtful specialty into a certain science.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY. By B. Joy Jeffries, M. D., Boston.

For the fifth time as your committee, I would make my report on the progress of our specialty. As I said last year, perhaps a running sketch, without criticism, of what has been published since we last met, will more readily inform those of the profession outside of our specialty what is going on among us, and also save time for some of us who are too busy to keep as thoroughly conversant with others' results as they could wish, and as the ever-advancing science of ophthalmology demands. I would again call attention to the report of our Secretary, Prof. Noyes, published in the New York Medical Journal early in this year. The articles he has there sketched I have, of course, omitted to notice in detail here. It has been fortunate that I could not finish this report till the time it was absolutely called for by the publishing committee, since thus I have been enabled to notice all the material which the war in France and Germany had delayed the printing of, and which, of course, properly belonged to the time when it was ready for the press.

I therefore here give a brief sketch of what has been published, since my last report, in "Graefe's Archiv für Ophthalmologie," now continued by Donders, Arlt, and Leber, the

"Klinische Monatsblätter für Augenheilkunde," the "Annales d'Oculistique," the "Royal London Ophthalmic Hospital Reports," the "Giornale d'Oftalmologia Italiano," the "Archives of Ophthalmology and Otology," and the new Italian journal, commenced this year, the "Annali d'Oftalmologia." I have also noticed some of the books and monographs published, and the scattered articles in various reviews and society reports. Appended is a list of those which time and space have failed me to sketch in detail; the ophthalmic journals where these latter have been discussed will be found mentioned, e. g., Zehender's Monatsblätter, or the Annales, etc.

Again, we would call the attention of our brother ophthalmic surgeons in this country to the fact that the profession at large have a right to demand from them a better *account* of their stewardship at the ophthalmic hospitals and infirmaries now established in our larger cities. Also, we may justly ask in return for a more definite recognition of our specialty on the part of many of the professional schools and colleges.

Ophthalmology has recently lost from its ranks some devoted workers and earnest thinkers. The pens of friends and colleagues have better told than I can here, what our specialty owes to Alexander Quadri, of Naples, and Auguste Serre, of Uzès.

While we were gathering last year from the various parts of this country to our annual meeting at Newport, one of the confessedly greatest clinical teachers and leaders passed away from his life and work. Albrecht von Graefe, I hold, was the greatest scientific practitioner in the medical profession. Higher praise I cannot give. That it is not too great has been amply proved by what has been written of his life and work by his nephew, Prof. Alfred Graefe, in his "Ein Wort der Erinnerung an Albrecht von Graefe," Halle, 1870; Dr. A. Goschen's "Albrecht von Graefe," Berlin, 1870; and Dr. Cohn's "Was verdankt die Menschheit Albrecht von Graefe," Breslau, 1871. An extended compilation of what has been said of Graefe will also be found in the Ophthalmic Hospital Reports, London, which journal, as well as all the other ophthalmic reviews in the different parts of the world, have spoken editorially of Von Graefe in such terms as are applied to but few, and deserved by as few.

Let the commemorative page at the head of this report prove to the profession that our Society recognizes what Albrecht von Graefe has done for us and them.

Archiv für Ophthalmologie, Bd. 16, 1870.

Corneal Abscess. Prof. Arlt.—The clinical reputation of our former master induces us to give in detail his report of treatment. He says, when we have an abscess, we must treat the patient as if already suffering from *iritis*, since this, if not already present, may occur any minute. The eyes are to be protected from strong light and accommodative efforts, and the iris kept under atropine.

As with the open corneal ulcer, so also with the closed (an abscess), we must decide whether pus-formation exists and continues with symptoms of irritation, as ciliary injection, tears, photophobia, and pain; whether, when these cease, the pus-formation stops; or whether the eye is in, so to speak, a torpid condition, with increasing purulent formation. In the first case every thing irritating is to be kept away, and we must use local bleeding, narcotic inunctions on brow and temple, and morphine injections, cooling cathartics, etc., without, however, reducing the strength too much. Simple opening of the abscess or of the anterior chamber in addition will be indicated or demanded on the yellow color of pus showing its collecting in the anterior chamber, the cornea, or both. He perfectly agrees with Weber's advice, to make the opening with an iridectomy-knife below the abscess, thrusting up and backward, making the cut $2\frac{1}{2}'''$ to $3'''$. He avoids turning the knife, in coming out, to prevent too rapid evacuation of aqueous, and uses a Daviel's spoon to gradually open the wound, and has fine forceps ready to remove lumps of pus sticking in the cut. He does not consider the perfect evacuation of the abscess or chamber absolutely necessary, since quite sizable remains of pus may be absorbed or extruded within twenty-four hours. He warns against injections, formerly advised. If merely the abscess is to be opened, he uses a cataract-knife, passing it through the under part of the anterior wall, making, not a cataract flap-like cut, but rather a linear or curved section. In regard to Sämisch's

proposed plan of opening corneal ulcers, Arlt will not at present decide. When there are only small deposits along the edge to be released, he makes a 1–2‴ long opening on either side. Sometimes a radial cut into the cycle-shaped deposit allows the pus to escape, or two or three such cuts may be made. He uses a compressive bandage tighter at first, covering also the other eye from light, and keeping the patient if possible a few hours in bed. On reappearance of pus in twenty-four hours, he uses a Daviel's spoon to open the wound only when the abscess progresses or severe pain returns. When a necessity for evacuation of the pus shows itself by the third day, or later, he again punctures in the same or a neighboring place. Although the continued pressing open of the wound was recommended by Himly in 1843, yet Arlt does not greatly favor it, since he found no good result after doing it two or three times.

He has had good results from opening the abscess, or the chamber alone, although, in spite of this, a goodly number of eyes have been lost after repeated puncture, where this result was quite unexpected. The patients were, however, all in poor condition, or affected with lachrymal blennorrhœa. He always slits up the lower canaliculus and evacuates the pus in these last-named cases. The excessive pain accompanying these abscesses is best relieved by opening the chamber, and warm moist applications. When pus in the chamber reaches the pupil, puncture is indicated to prevent iritic attachments and pupillary membranes, even when the condition of the cornea or pain does not seem to require it.

Iridectomy he does not so much favor from experience, perhaps, as he says, because he has regarded it as the *ultimum refugium*. It is not so readily done, since the iris may be quite soft.

If, now, we have the pus in the cornea quiescent or progressing peripherically, while the eye presents no conditions of irritation, then opening the abscess or the chamber, or both, are to be thought of; but, at the same time, we must decide whether this torpor is simply local or connected with the strength or spirits of the patient. Anxiety, care, and homesickness, act very depressingly, as if the vascular and nervous

activity were paralyzed thereby, and hence digestion and nutrition interfered with. Out-door exercise, stimulants, iron, quinine, and mineral acids, are then in place. Warm cataplasms are to be used only under the physician's eye. Small deposits may be touched, even where there is some irritation, with a sharp pencil of nitrate of silver, to expose the pus there collected.

Above all these absolutely necessary means, Arlt holds a compressive bandage, by which he means such as shall prevent *motion of the lids* quite distinct from the usual compressive bandage of Graefe. He uses also the collodion bandage, which he spoke of in vol. ix., p. 1, when the patient strongly objects to operative interference. In regard to Sämisch's operation so successfully used by himself, Arlt speaks with some degree of reserve. He says it, as all other operations, is to be postponed so long as there is fair hope of succeeding with the lint-bandage. His whole treatment is well worth carefully reading by any one having under his care these ugly forms of corneal abscesses.

Drs. Hippel and Gruenhager continue and finish their article "*On the Effect of the Nerves on Intraocular Pressure.*"

Dr. Monnik describes "*A New Tonometer and its Use.*" From a series of experiments he finds that the tension of a normal eye may vary considerably, rendering it difficult to decide sometimes whether an eye is to be considered hard or soft. Age has an influence on the ocular tension, increasing with it. Tension in myopes was found within the normal range, in hypermetropes as in normal. Tension varies in diseased eyes as in normal ones. With strong convergence, notwithstanding the subjective feeling of tension, there is, in reality, no alteration, contrary to what might have been expected from Dr. Schurman's results in his dissertation on the action of the antagonistic muscles. In reference to the pressure of vitreous and aqueous, experiment shows that the iris, at least after death, offers very little resistance.

Prof. Alfred Graefe reports an interesting case of *Blepharospasmus;* also one of "*A Seeming Perversion of the Law of Concomitant Squint in Certain Forms of Anisometropia.*"

The result of examination educed that, 1. One eye is hypermetropic, while the other may be myopic or emmetropic; 2. There is insufficiency of the R. interni; 3. Each eye has sufficiently good vision.

Now, as was proved, the covered myopic eye *converged*, the covered hyperopic eye diverged. Neglecting to notice this might, in certain cases, lead to practical mistakes.

Dr. Haase reports on the pathological anatomy of a case of "*Coloboma of the iris and choroid.*" It seems the retina may remain intact over a coloboma of the choroid; and, if further examinations should substantiate this, then it must be that the primitive ophthalmic groove closed at the right time, and some days later an interference occurred in the growth and development of the retina.

Dr. Claassen, on "*Resistance to Single Vision after Operation for Internal Squint, in reference to the Theory of Retinal Congruence.*" We give only his closing paragraph: "May not some psychological data underlie the meaning of this case, which may be peculiar to every individual, but not subject to such strict analysis as by the mathematical method; if so, then the principles elucidated are of still greater importance. Comparing the cases similar to this, published by Von Graefe and Alfred Graefe, and we shall find them explainable by the same fundamental laws. Hence the importance of separating the two elements of the visual act as distinct from each other—seeing with subjective visual field, only possible from *a priori* given extended retinal impression, and the projection of the visual field for the purpose of objective vision. The relations of congruence are the immediate result of seeing (Orientirung) in subjective visual field, and the combined use of the two eyes."

Accommodation in Presbyopia.—Drs. Adamük and Woinow report, as the result of absolute measurement, that the posterior surface of the lens becomes more curved in old people in accommodation than has been thought, even as much as the interior surface, but the two curves together are not as much as in young people. They say that, from their present data, they are quite unable to deduce the cause of this; their measurements, careful as they were, answered nothing in

reference to the question of accommodation. In the eyes examined they ascertained that the posterior surface of the lens changed, in relation to the anterior surface, more where the pupils were small.

The Movements of the Globe exhibited by the Phænophthalmotrope.—Prof. Donders shows, by a plate, the instrument thus called, which is contrived to exhibit the ocular movements correctly, a very desirable necessity for *teacher* as well as pupil. We must refer to the plate and article for his explanation, as without the former the latter would be unintelligible if here introduced.

Accommodation and Refraction. Dr. Schneller.—From a series of experiments we cannot here introduce, it is rendered probable that accommodation may take place differently in the two eyes, and that this variation, at least in myopia, may affect the refraction. This, once granted, gives us a further insight into the causal relations of many diseased conditions. May there not be a connection between this difference of accommodation and the fact that, in myopia, the right eye generally turns outward (in more than three to one of the cases), because there is here an anomaly of the accommodative position? It may be found in practice that more severe choroidal changes and deleterious affections of the eye are in myopia more frequent in the right than left. This would point toward taking care, in the selection of glasses for myopes, to consider this disposition of the right eye to injure itself by excessive accommodation.

The Contest of the "Nativisten" and "Empiristen," although a philosophical one, may be thus of eminent practical importance, and induce ophthalmic surgeons to test experimentally this question, and see whether Dr. Schneller's results are individual or general.

Contention of the Visual Field. M. Woinow.—This is a condition caused by exhibiting to each eye different pictures or visual fields. In some cases the dominant contour or color alternates; in others, the color of the whole field is more steady; and again, in others, we have the so-called glance or shimmer. Woinow found that the difference of the pictures to be combined may depend on variation in form; or, if the

form is the same, it may be due to difference in color or brightness; or, thirdly, it may depend on the clearness of the groundwork of the picture. In general, our *degree* of attention governs the perception of form. If we pay special attention to the bodily form of the picture, then the differently-colored outlines of the two stereoscopic pictures are seen side by side; if, on the other hand, we carefully examine the special details of the picture, then the "contention" takes place, and our will completely controls the appearing of one or the other picture. A general law held good that the contention was greater when the individual points of the picture were fixed, or when the color alone of the combined field was tested, especially if one of the combined surfaces was uneven. On the other hand, the contention was least when our attention was simply directed to the bodily form. As to the color of the common field, this is more quiet the less there is of contrast in the two fields (red and orange, orange and yellow, blue and violet, etc.). If there is considerable difference in the lightness of the two fields, then the common field shimmers.

As to this glance or shimmer, it is stronger the greater the contrast of the two fields in color and brightness; the latter, however, affects it most. The brighter the one and darker the other field, the stronger the shimmer; for instance, a black and a white surface. When we close one eye, and again presently open it, the common field appears more of the color which is now presented to the reopened eye. Occasionally, during certain moments, the alternating colored spots in the common field began to appear close to the object delineated, and at first took the form or figure which they would assume as after pictures.

On Color-perception. Same author.—By a series of careful experiments with colored papers, etc., Woinow has found that red appears yellow as soon as it is removed from the optic axis, and gradually shades into yellowish brown, becoming darker the farther removed it is, till finally it seems black. This last, however, greatly depends on the ground on which the color lies. If the ground is brighter than the color examined, then the peripheric perception of the color will be black;

gray, on the other hand, if the ground is much darker than the color. Orange thus becomes yellowish and gradually dirtier, to a peripheric gray of varying brightness, in accordance with the ground it is on. Yellow appears gradually less deep, more whitish, and on the periphery seems almost a clear white. Green exhibits in this method of examination very peculiar appearances. It becomes laterally yellowish. Some greens give at certain spots a good clear yellow. Toward the periphery of the visual field it becomes dirtier, and finally ends in gray, of varying brightness, in accordance with the ground it is seen on. Like yellow, it never appears black on the periphery, as the other colors. A peculiar phenomenon is noticeable, when we view the spectrum with one eye directed to the red end. We then see first red, then a broad streak of yellow, and finally blue. Green will not be seen as such, but as yellow. Violet is also not visible.

Blue becomes less intense—a grayish blue. On the periphery it appears black. If the ground is too dark, it gives the impression of gray. Violet passes into blue, quite a strong blue at some portions of the visual field. On the periphery it acts as blue. Purple red passes into a dark violet, then into deep blue, and finally, on the periphery, acts as blue and violet. The changes depend principally on the degree of saturation, that is, whether it is a pure purple red or a more rosy red. On the periphery of the visual field, where we have no definite differences of color-perception, and only can distinguish between light and dark, all colors give, according to their ground, varying shades of brightness. The borders, where differences of color stop, are very definite, and are not dependent on the ground of the color. The border-lines of the visual field for differences of brightness vary, and are greater the greater the relative difference between the brightness of the pigmented surface and its ground.

On Binocular Vision. Same author.—He proposed three experimental questions, namely: 1. The examination of the contraction of the visual field in accommodation for the near; 2. The condition of the eyes in observing objects at different distances from them; 3. The accommodation individual to each eye during binocular vision of laterally dis-

posed objects. Contrary to Hering's results, he finds under the first head that the excursive power of the eyes is not limited in accommodation. The visual field alone, not the "Blickfeld," is contracted. From his experiments he also deduces that, in monocular vision, when the eye alternately focuses for objects at different distances, it does not necessarily undergo any convulsive action, but simply changes its accommodation; this, of course, only when all the objects fixed are in one and the same line coincident with the visual axis.

In careful binocular fixation of lateral objects, the accommodation of the two eyes varies, the eye nearest the object accommodating more strongly than the other.

Hence, from all Woinow's experiments, he deduces that there is not exactly the same innervation in reference to accommodation and movements of the two eyes in binocular vision, and that it is therefore impossible to reduce the action of the two eyes to that of one double (Cyclops) eye, as Hering has proposed.

In reference to the Angle Alpha. Same author.—An additional article to his previous ones. In this he concludes: 1. That the angle α and γ not only vary in size, but have a different meaning; 2. That the angle α is of great importance as respects the elliptic and dioptric condition of the eye, and changes in accommodation, but has nothing to do with the refraction and position of the eyes; 3. That the angle γ, which is quite independent of the accommodation, has a certain connection with the refraction and positions (movements) of the eyes; 4. That the angle α can only be measured according to the principle of Helmholz's method, and the angle γ only according to Donders.

Rotation-point of the Eye. Same author.—Woinow, from experiment here declares that there is but one point of rotation in the eye. He holds that the eye not only turns round a fixed point, the rotation-point, when it passes from a primary to a secondary position, but also when it passes from a secondary into any other, and the changes of accommodation, as he has convinced himself, do not affect the rotation-point, as this remains unchanged.

The Intensity of Color-perception. Same author.—From a series of extremely interesting experiments, Woinow concludes

that the strength or intensity of color-perception is less than that of light-perception (shades). It is also different for different colors, independent of the brilliancy of the color or of the ground on which this is seen.

Experimental Research into the Diseases of the Optic Nerve consequent on Intracranial Troubles. Prof. Manz.—He found that, as soon as even a little fluid was thrown beneath the cranial wall, there was seen a filling of the retinal veins, most visible on their first subdivisions; the arteries and capillaries showing varying conditions. Thus, increase of the venous calibre, and their tortuosity up to pulsatory movements, are of course the consequence and expression of a stasis which the venous blood has met with somewhere between the optic-nerve entrance and the vein into which the vena centralis retinæ empties.

Woinow noticed also constantly a contraction of the pupil, certain rotations of the globe, and closure of the lids. As soon as a certain amount of fluid of any character entered the cranium, a contraction of the pupil quickly followed, generally quite considerable; it was a sign that, if the animal's life was to be saved, the injection must cease, or else the experiment was rapidly fatal. This is of course at variance with the assumed position that cerebral pressure causes dilatation of the pupil. With this contraction of the iris there was always, as said, rotation of the globe and closure of the pupil; the rotation was upward, often accompanied also with a strong rotation on the visual axis.

Some Rare Ocular Tumors. Drs. Hirschberg and Happe. —1. Glioma retinæ endophytum. In a young infant. No neoplastic growth in the uveal tract; it evidently started from the *pars ciliaris* and the neighborhood of the retina, and was microscopically undoubted glioma.

2. Sarcoma of the choroid and secondary tubercles in the retina and sclero-corneal region. Choroidal sarcoma occurred in a child twelve years old. The growth was free of pigment. The *secondary* tubercles in the retina came with *primary* choroidal tumor. Three interesting points.

Motions of the Hypermetropic Eye. Dr. Kugel.—The result of testing his own hypermetropic and astigmatic eye

was to formulate this, namely, that it differed the least from the normal eye in those positions which are mostly used in looking at distance or near; and the abnormal turning and variations in elevation were more prominent the farther the eye moved from these positions. Thus it would seem that these accustomed positions were, so to speak, cultivated at the cost of the other less frequently used ones, since the ocular muscles in their development are accommodated to the special needs of accurate vision in the most usual position of the globes.

Development of Acute Myopia. Same author.—From two cases reported, Dr. Kugel believes himself justified in assuming that lengthening of the bulb may take place in exceptional cases where there is no predisposition; this change is due to alteration of the tissue of the sclera, this coat not preserving resistance sufficient to withstand the normal pressure within the globe, a condition dependent on concomitant intracranial, retrobulbar, or subconjunctival processes, or from inflammations within the globe in which the sclerotic has participated.

Effect of the Crystalline on Tension of the Iris. Same author.—His arguments show that the lens does cause a certain tension of the iris. He also shows that increase of vitreous does not press the lens forward.

Trichiasis Operation. Same author.—Dr. Kugel has operated on five hundred the last two years, and devotes a few pages to speaking of his results, and the various well-known operations as compared with each other.

A Ready Method of detecting Monocular Simulated Amaurosis or Amblyopia. Same author.—This depends on the fact that, if we hold a colored glass before the eyes, and at one side it is not transparent, we shall not be able to say, off-hand, with which eye we are seeing, especially when the eyes have nearly equal power of vision. Monocular defects may also thus be demonstrated.

A Case of Acute Atropine-poisoning. Same author.—There was coma for sixty-two hours (the patient being fed by enema), before any reflex action was noticed, this latter consisting of a slight contraction of the lid to bright light. The

case was treated by repeated subcutaneous injections of morphine.

Inflammation of the Ciliary Region as Sequela of Febris Recurrens. Dr. Logetschnikow.—An epidemic of *febris recurrens* in Petersburg and Moscow gave the doctor opportunity to observe this peculiar affection, already spoken of by others, as Middlemore and Himly. He saw over seven hundred cases, and holds to his previously-expressed views that it is an inflammation of the ciliary body tending, but not always, to run over to the iris. It occurs in from a few days to several months after the fever. Cases occurred when it came on during convalescence, but the eyes were never affected *between the attacks.* A more complete article in reference to the nomenclature and true position of this disease will appear as a separate publication.

Archiv für Ophthalmologie. Albrecht von Graefe. Vol. xvii., part 1, *continued under* Arlt, Donders, and Leber.

The Development of Myopia, based on the Examination of the Eyes of 4,358 *Scholars, Girls and Boys.* Dr. Erismann, St. Petersburg.—We can here only give a glance at these extremely interesting series of observations made at St. Petersburg in seven *gymnasia* with scholars from 10 to 21 years of age; one progymnasium, four German schools (boys and girls), 8 to 20 years of age, and a female gymnasium for the education of teachers, of ages from 17 to 24. Whole number examined 4,358.

Myopes	1,317	= 30.2	per cent.
Emmetropes	1,132	= 26.	"
Hypermetropes	1,889	= 43.3	"
Amblyopes	20	= 0.5	"
Total	4,358	100	per cent.

Among 3,266 boys, there were

Myopes	1,017	= 31.1	per cent.
Emmetropes	867	= 26.5	"
Hypermetropes	1,369	= 42.	"
Amblyopes	13	= 0.4	"
Total	3,266	100	per cent.

Among 1,092 girls, there were

Myopes	300	= 27.5	per cent.
Emmetropes	265	= 24.2	"
Hypermetropes	520	= 47.7	"
Amblyopes	7	= 0.6	"
Total	1,092	100	per cent.

Among 2,534 pupils of the Russian Gymnasia there were

Myopes	866	= 34.2	per cent.
Emmetropes	654	= 25.8	"
Hypermetropes	1003	= 39.5	"
Amblyopes	11	= 0.5	"
Total	2,534	100	per cent.

And among 1,824 pupils of the German schools, there were

Myopes	451	= 24.7	per cent.
Emmetropes	478	= 26.2	"
Hypermetropes	886	= 48.6	"
Amblyopes	9	= 0.5	"
Total	1,824	100	per cent.

The author concludes that between six and seven years of age still more hypermetropes will be found. He found in the lower classes two-thirds of the children thus, and even one-third in the upper classes. Remembering that, without atropine, hypermetropia cannot always be determined, it would seem that it is the normal, the common, condition of refraction of the young uninjured eye; and what we call emmetropia, or still more, myopia, is an exceptional condition for this age. A small part of these large number of hypermetropes remain so; the majority become myopic after passing through a condition of emmetropia.

Cohn says it seemed as if myopia was transmitted from mother to daughter, or from father to son. Erismann says he cannot confirm this, only that with myopic girls the number of myopic mothers is greater than with myopic boys. The number of myopic fathers of both boys and girls was decidedly greater, being 57.6 per cent.

He deduces that the use of concave glasses in itself has a bad effect on the eye while its condition of refraction is in a

process of change, and it is a misfortune to be obliged to order glasses for a young myope. Their use should be limited as much as possible; music, drawing, etc., should be forbidden when the object must be brought very near, or glasses be worn. This, of course, refers to progressive myopia of youth, but is of the greatest importance here. The wish to see in the distance does not countenance glasses; it is time enough when these myopes wear a glass after the tissue of the bulb has become firm. When absolutely necessary at school, a lorgnette can be used.

The increase of myopes among the older school classes of more years' study shows that it is the occupation, with all its concomitant circumstances, which produces this condition.

The becoming myopic of a hypermetropic or emmetropic bulb depends on the lengthening of its axis. Erismann says he is perfectly convinced and sure that by far the principal cause of this myopic globe is the working at badly-constructed school-desks, and inadequate and bad light.

We have but sketched a few sentences, to lead our readers to carefully study through Dr. Erismann's article, which should be seen and understood by all teachers and school-committees.

Support of the Eye during the Expiratory Pressure of Blood. Prof. Donders.—He concludes that the *external* vessels of the eye, as well as the *intra-* and *retro-ocular* are distended during expirations. The closure of the eyelids either limits or entirely prevents this, partly from pressure, partly, perhaps, from certain associated action. It was noticed that during every increased expiratory pressure the lids were closed or tended to close. Hence, closing the lids, combined with the action of the ocular muscles, prevents injury from blood overfilling.

Movements of Eyes. Dr. Skrebitzky.—His experiments show:

1. That bending the head toward the shoulder while keeping the eye fixed on a point at the height of the eye, and firmly attached to the head, caused for short distances a real movement of the eye around its visual axis in a direction contrary to the movement of the head, but not to the degree assumed by Hueck.

2. That there is an undoubted proportion between the lateral turning of the head and the movement of the eye. For himself, he found this to be for ten degrees of lateral motion of the head about one degree of movement of the eye around its visual axis.

Cerebral Atrophy of Optic Nerve, with Pressure Excavation of the Optic Papilla. Dr. Schmidt.—He thinks his case may have some meaning in reference to others diagnosticated as *glaucoma simplex*, simply from the pressure excavation, and in which iridectomy was of no possible avail.

Sensitiveness of the Eye for Spectral Colors. Dr. Lamansky.—A series of experiments has shown that our eyes are more sensitive to green, yellow, and blue, and less sensitive to violet, orange, and red, than to white light, so that, by experiments with color-sensation, the brightness of white is not exactly unity for the other colors to be compared with, as Aubert held in his experiments.

Negative After-Pictures. Drs. Adamück and Woinow.—Their experiments gave the following results:

1. Peripheric after-images, produced in broad daylight, appear in different colors than central ones.

2. The duration of the impression of the primary light has no effect on the color-tone of the after-image.

3. The difference of color-tone of the peripheric after-images takes place in all meridians from the centre.

4. In reference to the difference of the colored after-images, the whole retina may be divided into zones, which perfectly agree with those of color-impression in general.

The experiments showed also: 1. The duration of the after-image is in general not only subject to individual variations, but varies also in the same person. When several experiments are made in succession, the second in the same way and intensity as the first, then the variations amount to only one to two seconds.

2. The central after-images last longest, especially those with binocular fixation. This is explainable by the fact that there is less effort in binocular than in monocular fixation. The after-pictures from double images last a shorter time, as both experimenters found, and shorter with convergent than with parallel visual axes.

The duration of the after-image from different pigments (seen on variously-colored grounds) is about the same; the difference of duration is so slight as to prevent our deducing any special effect of the ground color on the retina.

Changes of the Pupil during Accommodation. Drs. Adamük and Woinow.—From experimental observation they conclude that in general, during accommodation, the centre of the pupil tends inward from the optic axis; this tendency, however, is not in proportion to the accommodation. Moreover, this tendency only shows itself when the fixation changes from the far to the near point of the eye; that is, when the whole range of accommodation is called into play. When the whole range is not called for, as in changing from one to a neighboring point, then there are variations from the law above given; the pupil's centre tends outward from its former position, in which a more distant object was being gazed at.

Contributions to the Pathological Anatomy of the Eye. Dr. Berthold.—1. Total sclero-choroideal staphyloma, vascular formation in the cornea and vitreous, atrophy of the uveal tract, congenital posterior capsular cataract.

2. The alterations of the eyeball occurring in meningitis. These he found to be: 1. Due to a spreading of the inflammation of the meninges to the globe; 2. This takes place through the lymphatics by the optic canal; 3. According to the intensity of the extended inflammation and the exudation thereby existing in the lymphatics of the eye, we have either a filling of Tenon's space with chemosis conjunctivæ, or a filling of the subvaginal room with stagnant papilla and neuritis optica, or, in the worst cases, to purulent retinal and vitreous inflammation; 4. Iritis and irido-choriditis in meningitis are consecutive.

Three Cases of Phthisis Bulbi, Sequelæ of Melanotic Choroidal Sarcoma.

A Case of Granuloma Iridis.

Bony Formation in Choroid, New Growths in Vitreous, Peculiar Condition of Optic Nerve.

Historical Notice of Morbus Basedowi, with reference to twenty Cases of the Disease seen by Dr. Emmet, who says it should not be called *Morbus Basedowi*, or *Graves's Disease*,

but properly *Parry's Disease;* why, we must refer our readers to the article.

Abuse of Spirits and Tobacco as Causes of Amblyopia. Dr. Hirschler.—He thinks the abuse of both together the special cause of the disease; but, besides, must be reckoned all the additional conditions, hyperæmia of the brain, overwork of the eyes, producing troubles of the circulation within the globe, and individual peculiarities and dispositions. Prognosis is good if alcoholism has not proceeded too far; alcoholic amblyopia does not necessarily lead to optic atrophy; here "cessante causa, cessat effectus," leading in the first stages to complete recovery. When changes appear in the papilla the *restitutio in integrum* is no longer to be hoped for, yet a cessation of the process may occur and the visual power present be retained. The first indication for treatment is the removal of the cause; treatment of "magenkatarrh," strict diet, and open-air exercise. The author does not think much of antiphlogistic treatment often recommended, and only in place where there are internal hyperæmia of the globe and textural changes. Goudret's salve he has used very frequently.

True Rolling of the Eye around its Visual Axis. Dr. Nagel.—This is a second article, which goes with one by Nagel, in the fourteenth volume of "Graefe's Archiv." He here says that it is a rule, when the head is bent toward the shoulder, the eyes turn in the opposite direction, around their visual axis, about the sixth part (measured by degrees) of the movement of the head. The object of this seems to be to assist the sensation of poise (Gleichgewichtsgefühl). The degree and direction of this rolling of the eyes depend on the lateral movement of the head from the upright normal position, no matter how this latter is accomplished.

Thirty-eight Cases of Accommodative Paralysis. Dr. Scheby-Buck.—In nearly all these cases, dependent on different causes, a tonic treatment was pursued, combined with Calabar bean, which proved of great therapeutic value. He found: 1. Mydriasis in only one case of diphtheritic paralysis. In the other cases it occurred in only a small proportion. Mydriasis, when present, does not exactly coincide with the paralysis of the ciliary muscle. 2. Loss of refraction occurred;

always disappearing with the disease. 3. Occasionally loss of visual power was observed, depending perhaps on astigmatism of the lens, and disappearing with the accommodative paralysis. 4. Diagnosis can often be made by observing the absence of change of shape of the lens in changing accommodation. 5. Accommodative paralysis occurs with diphtheritic wounds. It has also been certainly seen in sausage-poisoning.

Clinical Cases. Dr. Landersberg.—They are as follows: 1. A peculiar form of epidemic ophthalmia. 2. Further contribution to the essentials of phthisis bulbi, in which he says some of the inflammatory processes of the cornea may also become the source of secondary glaucoma. 3. Chronic idiopathic œdema of the left upper lid and conjunctiva bulbi.

Anomalous Forms of Retinitis Pigmentosa. Dr. Leber. —(The new additional editor of this [Graefe's] Archiv.) He makes the following divisions:

1. Typical retinitis pigmentosa.

2. Retinitis pigmentosa with typical disturbance of vision and anomalous ophthalmoscopic appearances. Here belong:

a. The long-known retinitis pigmentosa *without pigment*, which passes with all possible shades into the common form. It shows that the essence of the process is not the pigmenting but the accompanying interstitial hypertrophy of the retinal neuroglia and atrophy of the nervous elements. In general, the ophthalmoscopic appearances are characteristic enough for diagnosis, even when pigment is absent.

b. Retinitis pigmentosa with disseminated atrophic masses in the choroid.

3. Retinitis pigmentosa with typical ophthalmoscopic appearances and anomalous forms of visual disturbance.

a. Retinitis pigmentosa with prominent loss of central vision.

b. Retinitis pigmentosa with typical ophthalmoscopic appearances and good central vision, but with variations in the other symptoms of visual power.

4. Retinitis pigmentosa with anomalous ophthalmoscopic appearances and anomalous visual disturbances. Here the most numerous are:

a. Amblyopia or amaurosis, congenital, from retinitis pigmentosa.

b. Retinitis pigmentosa, not congenital, with principally central amblyopia and absence of retinal pigmenting.

c. Chorio-retinitis pigmentosa with anomalous symptoms.

5. Retinitis pigmentosa with varying course, unequal affection of the two eyes. Dr. Leber says that what he has presented naturally tells us nothing of the cause of retinitis pigmentosa, and is but a slight contribution to the material facts. It may be at least assumed that retinitis pigmentosa is on the whole a many-sided affection. If we would retain the name of retinitis pigmentosa for the typical cases, we must grant that it shades through many variations into the allied forms of this disease, and can be considered but as one of several related affections, which is dependent on the parents' consanguinity, or is hereditary.

Needle-Forceps, a New Instrument to form Pupils in Tough Membranes. Dr. Heymann.—It can hardly be clearly understood except by seeing the accompanying woodcut of it, which we cannot here reproduce.

Archives of Ophthalmology and Otology, vol. ii., No. 1.

Formation of Bone in the Eye. Dr. Knapp.—His conclusions are:

Formation of bone in the eye is the consequence and final stage of a plastic inflammation of the capillary layer of the choroid. It invests the inner surface of the choroid, and continues, in the form of a transverse septum, through the anterior part of the vitreous humor, behind the ciliary body and the crystalline lens, without, however, involving these structures. The diseases which lead to ossific productions are chronic inflammations of the interior coats of the eye, called internal ophthalmia by the earlier, irido-choroiditis by modern writers. It should be particularly mentioned that chronic plastic inflammation limited to the ciliary body and iris, irido-cyclitis, which is not uncommon, and leads to the formation of false membranes before and behind the crystalline lens, has not been found to generate osseous tissue, nor has ossification been demonstrated as a sequel of iritis alone.

The diagnosis of ossification may be based upon the unyielding and hard condition of the posterior part of the globe, terminating about two lines behind the cornea, while the anterior region is soft, or at least impressible.

Simultaneous occurrence of calcification and ossification is frequent. Calcification may be diagnosticated by atrophy or degeneration of the iris, in combination with a shrunken, white or yellowish cataractous lens. As ossification does not involve the outer choroidal layers, nor the ciliary muscle and iris, it in itself is not to be dreaded as a cause of sympathetic ophthalmia. The latter can only result from irido-cyclitis supervening as a complication to ossific choroiditis. As long as an eye, in which ossification has been diagnosticated, remains free from irritation, and its fellow also, the removal of the former, for fear of sympathetic inflammation, is not indicated.

A Case of Glioma Retinæ, operated on at an Early Stage, and exhibiting some New and Peculiar Anatomical Conditions. Dr. Knapp.—He concluded that the very early removal of the whole organ was, therefore, a step approaching the practical solution of the question on morbid growths in general, and on intraocular tumors in particular—a question which, as a maxim, may be expressed thus: extirpate when the tumor is still a local disease, that is, before infection of the system has begun, and life will be saved.

Case of Pterygium superius. Dr. Knapp.—It resulted from an attack of blennorrhoic conjunctivitis in a child of eleven years of age, and seems to us more properly classified with symblephara, as he says most of the cases reported are.

Tumors of the Retina. Dr. Delafield.—He draws these conclusions:

1. The rule laid down by Hirschberg, that retinal tumors grow outward toward the choroid, has many exceptions.

2. The elements of these tumors only resemble the granules of the retina when altered by reagents and seen with low powers. When examined fresh and with high powers, they are seen to be identical with so-called lymphoid cells which compose so many new growths.

3. If we dismiss from our minds the superficial resemblance between the elements of these tumors and the retinal granules,

they at once take their place in the class of round-celled medullary sarcoma.

4. The variation in the size of the cell-body, and in the proportion of stroma in different parts of these tumors, is almost always found. This variation is the same which we find in most sarcomata, and is no reason why we should speak of a tumor as beginning as a glioma, and then becoming sarcomatous.

5. Not only the anatomy, but also the clinical history of retinal tumors, corresponds exactly with those of the medullary sarcomata.

6. The development of secondary tumors follows the rule laid down by Virchow for sarcomata, and occurs: 1. By continuous infection of the retina, optic nerve, and, perhaps, the brain. 2. By discontinuous infection, forming the choroidal, scleral, and episcleral tumors. 3. By metastasis proper, forming tumors on the bones, lymphatic glands, and liver.

The idea that the choroidal tumors are formed by continuous infection from the retinal tumors, and that the scleral and episcleral tumors are formed by continuous infection from the choroidal tumors, seems to be erroneous. In the very great majority of sections these tumors are evidently discontinuous. And even if in some few instances a scanty cell-communication is found between the two, it seems most probable, from what we know of other sarcomata, that this is a cell-growth posterior to the development of the secondary tumor. That, however, these secondary tumors, although discontinuous, are produced from cells which have wandered from the parent tumor, is possible.

Special Application to the Case of the Eye of Knapp's General Formulæ for Astigmatic Rays. Dr. Hay.

Iridectomia without Division of the Sphincter Pupillæ. Dr. Pope.—He has performed six operations, in cases which he says may come under the four following classes. The operation is of course optical, not therapeutic:

1. Those in which there is a central opacity of the cornea, and in which there has been acute or chronic internal inflammation of the eye, with or without adhesions of the iris to the lens capsule.

2. Those in which there has been perforation of the cornea with prolapsus of the iris, the pupil having suffered displacement, and being totally or almost entirely placed behind more or less opaque cornea. In case the cornea has suffered very decided changes in form, not amounting, however, to staphyloma, the operation is most strongly indicated. If there be present in the case iritis, or irido-choroiditis, which does not yield to treatment, it may be best to operate with division of the sphincter. If the pupil has been drawn to a very eccentric portion of the cornea by the prolapsus of the iris, it may still be best, in some cases, to excise the iris rather largely, without dividing its sphincter. When the whole pupillary margin has been engaged in the corneal opening, the operation for displacement, and that for iridectomia, after the usual method, are of course excluded.

3. Cases where there is diffuse opacity of the cornea, most marked centrally, and gradually diminishing toward its circumference, together with iritis or irido-choroiditis, with or without adhesions of the pupillary margin to the lens capsule.

4. Cases where an extremely eccentric pupil may be required, and internal disease of the eye may exist. It may even be best in this class of cases, when no actual disease is present, but when there is doubt as to whether the iris will allow of extreme displacement of the pupil without inflammatory reaction. This condition might be found in the cases of old persons in whom the pupil was rigid and but slightly dilatable by the action of atropine. Prof. von Graefe recommended the use of Calabar bean in order to contract the pupil preparatory to the operation for iridectomia, in those cases of glaucoma where the pupil is evidently dilated. It may be in some cases beneficial in the proposed operation, when the pupil is large, and the pupillary margin free. The bean was not found necessary by Dr. Pope, to whose paper we refer for the technic of this operation.

The Light Streak seen in the Centre of the Retinal Vessels with the Ophthalmoscope. Dr. Loring.—In last year's Transactions of our Society.

Observations on Cases of Paralyzed Accommodation. Dr. Colsman.—He reports cases due to the following causes: un-

due exertion; straining the eye during work over a bright fire; Hm; sequel of *rubeola;* after angina; still another case from the same; accompanying mydriasis; syphilis; after iritis serosa from herpes zoster ophthalmicus; syphilis.

Kerato-conus and its Treatment. Dr. Steinheim.—Three cases operated on by Von Graefe's method. An addition to the already published cases, and, if they do not differ from the others, yet, in their details and especially in their results, are sufficiently worthy of mention to direct attention again to this method of treatment, and assist in giving it its proper place in the manuals of ophthalmology. The patient in one case drew the illustrations himself.

Annales d'Oculistique. May, 1870, *to June,* 1871, *inclusive.*

Retinal Anæsthesia. Dr. A. Sichel.—By this term he means, not the absence of perceptive power in the retina, but the loss of transmission to the brain of the impressions perceived by it. In these conditions the retina perceives or receives the impression, but the patient is unconscious of it. Retinal anæsthesia generally occurs suddenly after some violent impression has affected the moral faculties of the patient a longer or shorter time. It will not appear at the time, but, sooner or later, some days afterward. There are no objective symptoms; the ophthalmoscope reveals nothing; phosphenes exist in every direction; the pupils act normally to light. Under examination with prisms the muscular action is perfect. Examination of the visual field affords us the only precise data. It is generally concentrically reduced, or we have scotoma, or, what is especially interesting, multiple variations. The patient's symptoms vary from slight amblyopia to complete amaurosis. Photopsy, photophobia, and achromatopsy, are observed in nearly every case. Often, vision is reduced to one-half or one-third. The disease may last a variable time, generally better and worse at times, as proved by the variations in the field of vision. Yet the affection seems to be quite benignant, always ending in recovery. As to treatment, this is to be especially directed to the general condition, and so determined by each individual case. Protection of the eyes from light, as much as possible, is the local treatment necessary.

Caries of the Orbit. Dr. Jules Sichel.—Published after his death, by his son, Dr. Arthur Sichel. This is a very interesting and instructive memoir, which Sichel commenced in 1840. It makes some 55 pages in the Annales, which we would gladly quote from, had we room here. It is based on the absolute experience of Sichel, *père*, and would be quite acceptable published in English as a monograph.

Clinical Observations. By Dr. Lebrun, of Brabant.—Epithelial tumor of the globe. Dermoid tumor of globe. Foreign body in the iris. Traumatic division of rectus internus five years previous; divergent strabismus; proraphie, cure.

Abscess of the Cornea. Prof. Arlt.—Translated by Dr. Schobbens, from vol. xvi., part 1, of Graefe's Archiv.

Table of Reciprocals, Dr. Schobbens, whom we should thank for the necessary calculations he has made for this table, by which we can readily calculate the effect of our combinations of glasses.

Pure (essentielle) Phthisis Bulbi. Dr. Swanzy.—A case observed at Graefe's clinique to be compared with others. Vide Arch. für Opth., xii., 2, p. 256; xiii., 2, p. 407.

Ophthalmia of Scrofulous or Lymphatic Children, and the Employment of an Ointment of Tannate of Lead. Dr. Schoenfeld.—The ointment is prepared by triturating ʒiss of tannate of lead with ʒiij of fine oil and ʒj of fresh lard, carefully washed. This the author speaks highly of in scrofulous ophthalmia of children.

International Tests for the Acuity and Range of Vision. Dr. Burchardt.—These have now been published, and we would call especial attention to them.

Clinical Report of Dr. Hirschberg.—Embolus of central retinal artery. Sudden blindness in an infant of eight months. Several cases of *membrana pupillaris perseverans.*

Artificial Fistula of the Cornea when this is so altered as to cause Blindness. Dr. Gradenigo.—He reports a case certainly successful enough to induce one to attempt likewise to cure the blind.

Ophthalmic Répertoire. Dr. Warlomont.—He wants others to follow him and print individual ideas about various

ophthalmic matters. He speaks of ocular inflammations; tincture of iodine with morphine in painful symptoms; local sublimate baths; ointment of balsam of Peru; lance-knives in iridectomy; how to remove suture-needles without separating the wound; circumcision of the cornea.

Strabismus. Dr. Javal.—The first and second parts of an article which will prove as practical as interesting. We commend its *study.*

Deafness in its Relations to Panniform Keratitis and Conical Incisor Teeth. Dr. Davidson.

Some Forms of the Intermittent Affections of the Eye. Prof. Quaglino.—Translated by Dr. Delstanche, from the *Annali di Ottalmologia*, vol. i., 1871.

Retinitis Pigmentosa; its Locality and Nature. Dr. Windsor.—Translated from the Manchester Medical and Surgical Reports. The conclusions are—1. That in certain, probably in the majority of cases, the trouble commences and is localized in the external layers of the retina. 2. The affection is probably inflammatory, and the processes inflammatory or nutritive in the adjacent portion of the choroid, the deeper layers of the retina and optic nerve, vitreous and lens, are secondary.

Opistoblefari. Dr. Albini.—Metallic plates to slip under the lids and compress or retain the globe in staphyloma, etc. Also to protect the globe when caustic is applied to the lids, and likewise to keep off the pressure of the latter. To protect an ulcerated cornea. They may be used like artificial eyes, and, when there is any vision, glasses may be set in them. They can be used to apply electricity to the eyeball.

Some Considerations on Color-Blindness. Dr. Galezowski.—From his researches, based on the examination of more than seven hundred and sixty-six patients affected with internal troubles of the eye, he would make three varieties of chromatic trouble. 1. Pathological contrast of colors. 2. Blindness to colors. 3. Scotoma to colors. The first occurs from the abuse of alcohol, and is seen in certain varieties of alcoholic amblyopia. He saw it thirty-four times in one hundred and thirty-three patients, i. e., twenty-five per cent.

Pathological blindness to colors occurs with optic atrophy and amblyopia from alcohol, hysteria, or syphilis. In the

progressive atrophy of the papilla there is often noticed a peculiar variety of dyschromatopsy, and that is, blindness for green first, and after for red. Nearly all patients mistake green for gray, and, as the trouble increases, red becomes more and more dull, changing to brown and afterward black.

Hysterical amblyopia occurs most frequently in one eye, and that the left. The patients lose the power of distinguishing colors. Thus, yellow and rose appear white, while green, crimson, and blue, are black.

Optic neuritis, hemiopia, and other varieties of cerebral amblyopia, are often exempt from color-blindness. Of thirty-five cases he found chromatic trouble in but five; one patient could not tell yellow or blue, the other three confounded red and green. Inability to distinguish yellow indicated a syphilitic cause, and the optic neuritis was accompanied by choroiditis and syphilitic retinitis.

Albuminuric retinitis causes very irregular color-blindness; more often the patients recognize the principal colors, and only confound the secondary shades. Some remark a peculiar central scotoma. Glycosuric retinitis is rare, and produces color-blindness only when accompanied by atrophy of the papilla.

Congenital pigmentary retinitis does not generally cause color-blindness. Of twenty-one patients three only could not distinguish green, blue, and yellow; red appeared of a deep violet. This alteration of chromatic faculty is observed always at an advanced stage when the region of the macula lutea is invaded by pigmentary infiltrations.

In syphilitic choroido-retinitis the patients do not recognize yellow, the color last lost in cerebral atrophy of the papilla; blue and green are frequently lost; red often appears black.

Central Scotoma for Colors.—This is probably due to alterations at the macula, and to certain varieties of atrophy of the papilla. Retinal apoplexies occupying the region of the macula often temporarily or permanently compromise central vision.

In a number of cases of retinal detachment there was observed a peculiar chromatic trouble, namely, colored vision,

appearing either before the disease or during the first days of the detachment. The patients state that for some days, weeks, or even a longer time, they have seen every thing colored blue or violet. This is remarked most frequently during the first days of the trouble. Lights, the flames of lamps or candles, appear quite bright, and of a beautiful blue, sky-blue, or sea-blue. In fifty cases of detachment this was observed sixteen times.

Zehender's Klinisch Monatsblätter für Augenheilkunde, February, 1870, to May, 1871, inclusive.

Description of a New Ophthalmometer. Dr. Emmet.

Still another Ophthalmometer. Dr. Zehender.

An Exquisite Case of Monocular Triplopia. Dr. Dufour. —Caused by an eccentric pupil, and two additional holes through the iris.

Exophthalmos from Orbital Aneurism. Dr. Shiess-Gemuseus.—Treated with partial success by ergot-injections, digital compression, and ligature of the carotid.

Graefe's Peripheral Linear Section, Dr. Steffan, who now accepts Graefe's assertion that the largest lens may be removed through a cut of 4.5‴ inner length, and 0.5‴ height of flap.

Aphorism on the Success of the New Cataract Operations. Dr. Stilling.—He attributes this success to the cut being subconjunctival.

Acute Neuritis Optici with Tumor of Brain. Dr. Schiess-Gemuseus.

Strabismus Concomitans, Convergens, Intermittens. Dr. Wagner.

Monocular, Vertical, Oscillating Nystagmus. Dr. Zehender.

Chronic Spasm of the Eyelids. Dr. Talkow.—This case was treated by section of the supraorbital nerve. The author concludes by saying that the patient, though still complaining of his endless trouble, yet admitted that the neurotomy was of inestimable benefit to him, and would have been of still more, had it not caused loss of sensation in the skin, and pain in the forehead. About a year after, he returned to the hospital with

muscular rheumatism of the lower limbs. Besides the muscular pain, there was an unpleasant drawing sensation in the extensors, in the fingers. The blepherospasm had disappeared, the right sphincter alone occasionally contracting. The left supraorbital region has, however, become more sensitive. The case and treatment are of interest to any one who thinks of neurotomy for the pain left in old people after an attack of herpes zoster ophthalmicus.

Astigmatism and Cranial Formation, Dr. Wecker, who reports to the Paris Anthropological Society, July, 1869, that: 1. "The anomalies of refraction, known as astigmatism, stand in direct relation with the formation of the skull, and this holds good in cases besides those where, as Donders said, the anomaly of refraction was excessive. 2. The formation of the eyes and indirectly of the skull determines the written characters." We may thus decide, from the old sculptured letters, the form of the eyes and of the skulls of those who cut them.

Congenital Choroidal Coloboma without Iritic Coloboma. Dr. Talkow.

Acute Conjunctival Œdema. Dr. Zehender.

Xanthelasma Palpebrarum. Dr. Hirschberg and Dr. Talkow.

Post-mortem Examination of an Intraocular Cysticercus. Dr. Sämisch.

Tumor of Back of Orbit, and Nasal Cavity. Dr. Rheindorf.

New Iris Forceps. Dr. Liebreich.

Cancer, starting from the Conjunctiva of the Lid. Gliosarcoma of the Retina. Dr. Hirschberg, with explanatory woodcuts.

Cataplasms in the Treatment of Acute Iritis. Dr. Schiess-Gemuseus, who reintroduces poultices, and says he finds them of great use in treating acute iritis, as also in secondary iritic processes and injuries, or cataract operations.

Ulcus Corneæ Serpens, Dr. Pagenstecher, who has tried with great success Sämisch's proposed method of treatment, by cutting through the corneal ulcer. His success others have not always met with.

Atrophy of the Optic Nerve, following Erysipelas of the Face.—Dr. Pagenstecher reports a curious case.

Subretinal Effusion in the Region of the Macula.—Dr. Betke, who thinks the whitish color left was due to fatty degeneration of the effused blood. Sudden total amaurosis of left eye; complete recovery. Intraocular glioma. Iridocyclitis with great changes in the visual power. Entrance of the whole lens into the anterior chamber after discision, spontaneous absorption without interference. Cataract with fluid vitreous; attempt at extraction, subsequent discision. Complete traumatic amaurosis, total paralysis of all the ocular muscles except the trochlearis, and partial paralysis of this. Purulent periostitis without exophthalmos, subsequent keratitis parenchymatosa. Sclerosis keratitis, iritis, episkleretis. Parenchymatous keratitis, subsequent iritis with corneal opacities from sclerosis. Sclerosis of cornea, partial right, total left; chronic iritis episkleritis. These are all clinical cases sketched by Dr. Schiess-Gemuseus.

Action of Calabar Bean in Diphtheritic Paralysis of Accommodation. Prof. Manz.—He advises his colleagues to try Calabar bean, for he says, although the spontaneous cure of accommodative paralysis may be generally expected, yet even with treatment by good diet, iron, and quinine, or by Jacobson's method by convex glasses, takes weeks or months, while the methodical local application of the bean acts so much more quickly as to entirely recommend it.

Acute Formation of Cataract. Dr. Ritter.—The opacity came on in a lad, aged nineteen, within a week, sufficient to cause the patient to grope about the house. Dr. Ritter suggests whether the lad's occupation, standing at a brick furnace, and exposed to blasts of intense heat, was not the cause. There was no disease of fundus present so far as could be ascertained.

Gummy Tumor of the Conjunctiva of the Bulb. Dr. Estlander speaks of this and other similar cases reported. Iodide of potassium had no effect. He says, as in syphilitic iritis, energetic inunction or other mercurial course is in place.

The Central-venous Retinal Pulse in Epilepsy and Allied Conditions. Drs. Köstl and Niemetschek.—Their observations tend to show that epilepsy is produced by cerebral anæmia, whether this is due to general lack of blood, dilatation of the art. thyreoidea sup., contraction of the carotid, stenosis of

the aorta, or lessened contractility of the heart's muscle. The anæmia is seen in the eye by blanching of the papilla. The increased motor activity and psychical exaltation following the anæmic condition, can only be explained by the increased flow of blood to the brain, and thus in the period of reaction there is an increased reddening of the papilla. This reactive hyperæmia is characterized by ectasia of the central vein, greater filling of the optic capillaries, and turgor of the retinal network.

The Blind in the Archduchy of Mecklenburg.—The combined numbers for October, November, and December, of 1870, give an interesting report of some one hundred pages, under the following heads: Official Report of the Number of Blind; Comparison with the Numbers in some other Countries; Deaths; Degree of Blindness; Ages; Causes; Relative Health of the Blind; Occupations; Blind Asylums; Possible Occupations, etc.

Tumors in the Neighborhood of the Eye. Dr. Horner.—These are reports of a series of tumors in the lids, conjunctiva, lachrymal gland, and orbit; of interest, on account of their rarity or course. The microscopic examination was made by Prof. Eberth. Fibroma molluscum of upper lid. Multipled cell, melano-sarcoma of the conjunctiva tarsi. Cancroid of the conjunctiva bulbi at an unusual spot. Fibroma, papillary of the conjunctiva bulbi. Carcinoma of the lachrymal gland. Periosteal fibroma of the orbit. Pigmented cavernous angioma of the orbit. Recurrent myxo-sarcoma of the orbit, metaplasia. Cysticercus in the orbit.

Arrangement of Prisms for the Better Measurement of Lateral Deviation in Insufficiency. Dr. Berlin.—By his arrangement, he holds that we have a limited but a sufficient series of glasses, within the range of which there are no greater sources of error than the method of trial offers. The use is more easy, leaving one hand free, and allows of much quicker measurement.

Neurosis Nervi Optici et Retinæ. Dr. Pagenstecher.—Great anæsthesia of the retina to white light; reflex irritability from opticus and retina, shown by peculiar appearances of color. Contraction of the visual field; spasm of accommoda-

tion. Cure by wearing blue glasses, and use of the constant current.

Double Isolated Rupture of the Choroid. Dr. Talkow.—This makes the thirty-second so far reported in ophthalmic literature.

Gunshot-Wound of the Orbit without Injury of the Globe.

Case of Blepharospasm. Prof. Sämisch, of Bonn.—Contributions from ophthalmic practice during the war.

Phantasms during Sleep. Dr. Geissler.—An interesting article, in the closing sentence of which, the author says he cannot regard the phantasms as pathological, since they occur under perfectly regular diet, and absolutely clear mental action and activity. These being so little spoken of, would lead to the idea that they but very unfrequently occurred. This conclusion, however, is doubtful. We may readily convince every one that they have *muscæ volitantes*, and yet few know of their existence. And this very fact deterred Geissler from inquiring among the laity for phantasms. If they are physiological, then, when once recognized, they are with difficulty gotten rid of. This is by no means pleasant. Their artificial reproduction or increase might make among the laity, as with entoptic globules, a confirmed hypochondriac.

Iritic Exudation taking on a Peculiar Form. Dr. Schmidt.

Congenital Defect in the Lens. Dacryo-adenitis with Abscess. Dr. Schiess-Gemuseus.—In the first case there was an absence of one edge of the lens, as if a concave piece had been taken out, about one-fourth of the whole lens. Here the dilated pupil was free of the lens, looking almost like a lateral dislocation.

Glioma of Both Eyes. Dr. Geissler.—A child, six months old. There was atrophy of both optic nerves up above the chiasma. No convulsion or cerebral symptom up to the time of death.

Zehender devotes some twenty pages to analysis of the Transactions of our Society.

Royal London Ophthalmic Hospital Reports. Vol. i., Part 1. February, 1871.

Cases of Temporary Anchyloblepharon. Mr. Workman reports from Mr. Bowman's Practice.—In a case of ectropion he conceived the idea that, if, after releasing the tissues, he were to unite the upper and lower lids for a time, he would obtain a better effect than by simply performing a plastic operation. The result fully realized his anticipations, as the band of union between the two lids prevented, to a great extent, the upper one being drawn up again, while the tissues were cicatrizing at the site of the plastic operation. The success of this proceeding has led to its being adopted in another class of cases—that of palsy of the seventh nerve, where the patient is unable to close the eye, which, in consequence, suffers from constant exposure. Here, too, the result has been very satisfactory. Mr. Bowman cautions, in this operation of uniting the eyelids for a temporary object, care must be taken not to interfere with the subsequent integrity of the tissues at the tarsal margin. If delicately done, it will be found sufficient to shave off a very thin slice of the opposed margins along the line of the Meibomian orifices, not including that of the cilia. Very fine threads should be used, and should extend beyond the bare surfaces, and take a good hold of the edge of the lid, so as not to cut themselves out. They should be removed on the fifth to the eighth day.

Lead Poisoning as a Cause of Optic Neuritis. Mr. Hutchinson.—Three good ophthalmoscopic pictures explain what he means and what he has seen, and to these, with the cases reported, we would refer our readers.

Punctured Wound of the Sclerotic, with Escape of Vitreous, treated by closing the Wound with a Suture. Mr. Lawson.—He found that, if the sclerotic wound be closed by a single fine suture, and the escape of the vitreous be arrested, union of the cut edges will rapidly follow. The suture should be of the finest silk, and to each end of it a needle should be fastened, so as to allow of the silk being drawn through each edge of the wound separately, and from *within* outward.

Case of Sympathetic Retinitis Pigmentosa. D. A. Robertson.—This he believed to be a true example of sympathetic ophthalmia, although the character of the inflammation differed from that which we usually observe resulting from sympathetic irritation; for while this disease is usually characterized by plastic inflammation of the iris, extending back to the ciliary processes and choroid, this had as its chief feature retinal inflammation with pigmentary deposit.

The Treatment of Sämisch's "Ulcus Corneæ Serpens." Dr. Pagenstecher.—He has tried this slitting through of the ulcer twelve times, and with almost unexceptional success. He deduces—1. That the ulceration on the cornea is arrested in its progress, and retained within its already acquired limits. The clouding of the cornea, so inimical to the sight, is thus reduced to the utmost possible minimum. 2. The base of the ulcer is cleansed, and becomes more transparent, and the existing infiltration, limited to one side, disappears totally after a few days. In one instance he noticed this to have taken place at the end of twenty-four hours, in another at the end of thirty-six hours. 3. Hypopyon, when such existed, or the particles clouding the aqueous humor were, to a very great extent, at the time of the operation, emptied out, and the absorption of such particles as remained behind was much accelerated. Hereby one danger, frequently unavoidable under other modes of treatment, is obviated—the organization of these elements; and the closing of the pupil thereby often occasioned, or its adhesion to the anterior capsule, is much diminished. 4. The irritation of the iris decreases rapidly; and in cases submitted to treatment at an early period, a very favorable mydriasis is seen soon to set in. 5. Ciliary neuralgia, when present, is completely allayed—if not immediately, within a few hours.

We would strongly recommend a perusal of this article of Dr. Pagenstecher to any one intending using Sämisch's method of treatment.

A Case of Amaurosis after Erysipelas. Mr. Hutchinson.—This very interesting case he prints in connection with two cases of

Atrophy of the Optic Nerve after Erysipelas of the Face, Dr. Pagenstecher, observed at the ophthalmic institution at Wiesbaden.

Miscellaneous Cases and Observations. Mr. Hutchinson.

Albinism (incomplete). Divergence and oscillation of the globes.

Albinism in a brother and sister. Defective vision and oscillation of globes in both. Hypermetropia.

Artificial eyes worn by young children (three years of age).

Failure of sight during lactation, and its meaning as a symptom.

Loss of accommodation from nervous shock.

Pyramidal cataract after purulent ophthalmia, but in one eye only.

Myosis and irido-plegia from brain-disease. Autopsy.

On the occasional intractable character of pustular ophthalmia.

Pyramidal cataract in one eye only, with corneal opacity.

Mydriasis and cataract in infancy in connection with syphilis. Subsequent dislocation of the lens into the vitreous. Excision of the globe.

Acute abscess in the lachrymal gland. Good recovery after incision.

Retinitis pigmentosa. Chronic rheumatic arthritis.

Case of congenital cataracts, with myopia and deafness.

Symmetrical ptosis in a child after purulent ophthalmia. Operation.

Case of extreme myopia. $V=\frac{2}{70}$ with $-\frac{1}{2}$.

Neuro-retinitis in connection with albuminuria and disease of the heart.

Atrophy of left optic disk, and deafness on the same side, after a severe blow on the head, which was attended for a time with hemiplegia.

Hereditary syphilis; severe ulcerations since childhood; characteristic teeth.

Keratitis; rapid improvement under iodide of potassium.

Giornale d'Oftalmologia Italiano. (Continued from our last year's Report, through the numbers for 1870, all so far received.)

Three Cases of Penetrating Wound of the Eye from Percussion Caps. Prof. Businelli.—These well support the hope, in which we join, that the professor closes with, namely, that some law might prevent the sale of the poorer qualities of percussion caps, and that, in the perfection of fire-arms, these may be quite done away with. *Quod est in votis.*

Under what Circumstances the abuse of smoking Tobacco and drinking Alcohol produces Amaurosis. Dr. Reymond.—He would treat cases much more actively than the mere abstinence from tobacco or stimulants. He uses also paracentesis of the aqueous chamber.

Cysticercus in the Vitreous. Dr. Marini.—He decided it was a cysticercus tenuicollis of Rudolph.

Some Cases of Syphilitic Ophthalmic Disease cured by the Hypodermic Injection of Calomel. Prof. Quaglino.—Of special interest to the student of syphilography.

Removal of Capsule and Lens together in Cataract..—Prof. Gioppi continues his report on this, together with correspondence on the same from his Italian colleagues.

Prof. Cesare Paoli published in the "Sperimentale" accounts of the bad effects of petroleum-light on the eyes, and in the Italian Journal of Ophthalmology Drs. Calderini and Reymond publish two articles on protective glasses against the chemical rays in gas and petroleum lights.

Hemeralopia in a Woman operated on for Cataract, appearing spontaneously with the Effect of Sunlight. Dr. Reymond.—This was an interesting case, showing that hemeralopia may be developed by other causes. Clinically it was shown that it was here due to the existence of minute blind points in the centre of the retina.

Quinine as a Topical Application in Affections of the Eyes.—Dr. Flarer follows Nagel's suggestions made at the Heidelberg Congress in September, 1869.

Lachrymal Fistula cured in Eighteen Days by Destruction of the Sac, with some Considerations on the Conditions in which Caustic is applicable. Dr. T. Frassati.

The Principles governing Inflammations of the Eye. Dr. Rosmini.—This is the first portion of quite an extended article not yet finished.

Interpretation of Hemeralopia Aphorisms. Dr. Reymond.

Electricity in Granular Conjunctivitis. Dr. Rodolfo.

Besides the articles enumerated, the Italian Journal of Opthalmology keeps its readers apprised of what is going on, by analysis of all the other ophthalmic journals published in English, French, and German.

Report of the Medical Society of Steirmark. 1869–'70.

Dislocation of the lens; exhibition of a patient. Dr. Blodig.

Case of *carcinoma medull. bulbi* removed; patient exhibited. Dr. Keller.

Three cases of prolapse of the iris exhibited by Dr. Keller.

Treatment of acute ophthalmia blennorhagica. Dr. Ninaus.

Annali di Ottalmologia. Under direction of Prof. A. Quaglino.—This is a new Italian ophthalmic journal commenced this year, 1871, and published at Milan. The first number contains the following:

Some forms of intermittent ocular affections. Prof. Quaglino.—This has been pretty completely translated in the Annales d'Oculistique, vol. i., for 1871, p. 119.

Contribution to the Clinical History of Ocular Tumors. Prof. Quaglino.—These are: 1. White sarcoma of the choroid; 2. Detachment of the retina, followed by cataract, consecutive symptoms of glaucoma with rebellious periorbital neuralgia, enucleation, melanotic sarcoma of the choroid; 3. Squint and paralytic diplopia; consecutive atrophy of the papilla, with amaurosis and mydriasis; exophthalmos, enucleation of the globe, and extirpation of the tumor; myxoma of the optic nerve.

Molluscum Contagiosum. Drs. Bizzozero and Manfredi.

Experimental Studies of Inflammation of the Lens. Dr. Forlanini.—He gives only the results of his researches hereafter to be published in detail. He holds that a suppuration of the true fibres of the crystalline is possible.

Development of Optic Neuritis in Cerebral Affections. Dr. Flarer.—Dr. Forlanini follows this with his observations and experience *à propos* to Dr. Flarer's memoir on optic neuritis.

Formation of Bone in the Eye. Dr. Knapp. *New York Medical Journal*, February, 1871.—He, from observation of several cases, concludes that the origin of true bone in the eye may always be traced to plastic inflammation of the capillary layer of the choroid. Calcification may occur, and has been observed in every tissue of the eye, but ossification only in connection with the vascular chorio-capillaris. The nature of the ossific process in the eye is the same as that in connective tissue generally, the same as in the formation of bone from periosteum. The cells (white blood-corpuscles) and intercellular substance are poured out, the former in some places densely crowded; and then, with a clear line of demarcation, the infiltration with chalk begins. In some portions, the connective-tissue corpuscles are still preserved round, or nearly so, having few offsets; but the more the chalky infiltration advances, the more numerous the offsets become, communicating with each other to form the canaliculi. The round, movable, lymphoid cell, putting forth its processes and retracting them again, becomes, first, the jagged cell of the osteoid tissue; and, finally, the stellate cell—the real bone-corpuscle.

Contributions to Ophthalmic Therapeutics.—On the period of operating in Senile Cataract. R. B. Carter. Practitioner, March, 1871.

I cannot resist quoting his closing remarks in speaking of Graefe's new cataract-operation: "Besides influencing our judgment about the time for the performance of extraction, the new operation has greatly taken from the importance of several conditions that used to be regarded as almost prohibiting interference. In the days of flap-extraction, cough was a great bugbear, and frequently caused prolapse of the iris into the wound. Now that the piece of iris opposite the wound is excised, no such prolapse can take place, and cough is comparatively, perhaps absolutely, harmless. In the same way conditions requiring frequent recourse to an upright posture, such as asthma or irritability of the bladder, have very little influence upon the small section. Chloroform, which was shunned by many in flap-extraction for fear of the straining of sickness, may also be administered with good effect, and

protracted confinement to bed is no longer necessary. It follows that many of the fears and precautions with which cataract-extraction was once properly surrounded, may now be regarded as belonging to the past, and that they should be suffered to go the way of the circumstances in which they took their origin. Surgery can boast of few greater triumphs than the modern improvements in cataract-extraction; and these improvements have been brought about in the only right and sound way, by careful study of all the sources of failure in the old operation. It is now time that the public should enter upon the full fruition of the benefits that have been thus obtained for them."

Return of Vision after Atrophy of Optic Papilla. Dr. R. P. Oglesby. *Dublin Quarterly*, 1870. See also his previous publications in *Lancet*, August 22, 1868; Royal London Ophthalmic Hospital Reports, April, 1869.—He makes three periods in the process of recovery, to the third of which he would call special attention: 1. If the patient does not distinguish colors with a certain degree of assurance, it is rare that vision becomes reëstablished to any great degree. 2. If color-perception is pretty good, the patient may recover, most probably, a degree of vision that will enable him to go about alone, or do some coarse work. 3. If the patient distinguishes colors readily and with facility, entire recovery of sight is probable.

Leipsic Ophthalmic Dispensary. Its first five-years' report from Drs. Coccius and Wilhelmi.—We wish all ophthalmic hospitals and infirmaries would give us like experience of what has and is being done within their walls. We quote only what they say as to Graefe's peripheric linear cataract-operation: 1. Removing the cut from the cornea to the neighboring sclerotic tissue greatly lessens the danger of corneal sloughing, and thereby improves the chances of success. 2. In an eye without the lens, an iridectomy downward, if not too large, does not materially affect the visual perception as compared with a sound pupil. 3. A comparative glance at the two series of operations they report would incline them to trust most to a *preparatory* iridectomy rather than a contemporaneous one. In 127 cases, they lost but *two* from sup-

puration of the cornea, which they say is decidedly better than the results with the corneal flap-operation.

De l'Ophthalmie névro-paralytique. Dr. J. B. Coppez.—This name he gives to the group of changes that take place in the eye after section, paralysis, or irritation of the fifth pair of nerves. To be more precise, the ocular lesions are due not to an absence of the nervous influence, as the term "névro-paralytique" might imply, but to an irritating agent acting exteriorly on the anatomical elements of the cornea, or interiorly on the nerve itself, and thus, by means of the nutritive and formative irritation, an exaggerated cell-proliferation. He admits this last mode of action is denied by the majority of physiologists, who cannot produce it experimentally. But surgical pathology, in advance of experimentation, must needs admit the direct influence of the nervous system on nutritive phenomena, from the evidence of numerous and tested facts which careful observation daily accumulates. To the essay itself we would refer for proof of the above.

The Ophthalmic Phantom and the Ophthalmoscope as an Optometer. Dr. Franz Mohr. Wurzburg, 1870.—He recommends his apparatus to all interested in ophthalmoscopy, examination with the upright image, and optometry, convinced that it will greatly assist students and teachers in ophthalmoscopy, and enable them to employ Jäger's pictures where the living eye cannot be used for teaching or demonstrating.

Étude sur l'Iridectomie. Dr. Pomier. Paris, 1870.—He gives the diseases in which the operation is applicable and how it is to be carried out—as an optical effect, for prophylactic reasons, as an antiphlogistic, and still more, *in extenso*, its use in Graefe's peripheric linear operation for cataract. A *résumé* is in *Zehender's Journal*, May, 1870, page 156.

Ueber die therapeutische Wirkung des Atropin auf myopische Augen. Dr. Wosch. Basel, 1871.—An inaugural dissertation before the medical faculty of Basle. The author concludes that atropine is the only known remedy which, in a certain class of cases, produces a decided effect, namely, a pushing off of the far-point; in others, renders stationary a

process which is otherwise progressive, not only according to Donders's statement, but in accordance, also, with the experience of all scientific physicians. His method of employing atropine has the additional value of showing the patients and those around them that the accommodative efforts are what increase the myopia, and this often very rapidily. Thus they will be induced to avoid such hurtful influences, and so much is already gained. His plan also is devoid of danger when the eyes are properly protected against too great light.

Aside from the therapeutic value, the use of atropine is of worth in the pathological physiology of the eye. It proves that, in the large majority of cases, the myopia is the result of two components. Their relative value depends on the duration and amount of the myopia. The longer this has lasted and the larger it is, the greater is the import of the axial elongation compared to the cramp. The more recent the myopia, the more is it to be laid to the cramp. His experience would indorse this, namely, that atropine acts persistently only in young people, while in older myopes this does not hold. He considers his results of etiological value also. Donders was inclined to consider that there was in every case of myopia a congenital, generally hereditary predisposition, and he rejects totally a primary cramp of the muscles of accommodation. Of the author's patients, mostly of the educated classes, the majority denied having been previously myopic, and myopia could but seldom be traced to other members of the family. Of the cases, he holds, moreover, a majority were purely and simply acquired by constant accommodative effort. His results are only explainable by accommodative cramp, which, having commenced, caused, by long continuance, axial elongation. This last seems proved by the fact that in those cases where atropine removed only a portion of the myopia, this, therefore, being dependent both on cramp and axial elongation, the myopia began first to show itself at the time when accommodative effort was imperative.

Several new or newly-edited hand-books or compendiums have appeared, since my last report, to be here mentioned. This is not the place to criticise them, as the journal-reviewers take care of that much better. Schauenberg sends out

the fifth edition of his "Ophthalmiatrik," with 40 woodcuts, a volume of 350 pages. Rheindorf gives us the second edition of his "Handbuch der Augenheilkunde," with 23 cuts and 238 pages. Ignatz Meyer publishes the third edition of his "Compendium der Augenheilkunde," with 16 cuts and 358 pages. Schelske offers the first part, 202 pages, of a "Lehrbuch der Augenheilkunde." Schweigger, who has taken Graefe's place, has written a "Handbuch der speciellen Augenheilkunde," with 43 cuts and 538 pages. Tetzer's "Compendium der Augenheilkunde" has been issued by Dr. Grünfeld, with three lithographic plates and 488 pages. Klaunig has edited a "Compendium der Augenheilkunde," of 300 pages, dated Leipzig, 1872.

German students and practitioners at least seem, therefore, to be well looked after in the matter of hand-books. Mr. Soelberg Wells keeps his "Treatise on Diseases of the Eye" up to the times, and we would again recommend it as the best book for the English or American student or practitioner.

Books, Monographs, and Journal Articles not noticed in the Report.

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Sympathetic Ophthalmia. Dr. T. R. Pooley. New York Med. Journal, October, 1870.

Anterior Epithelium of the Cornea. W. Krause, Reichert in Du Bois-Reymond's Archiv, July, 1870.

Ciliary Muscle. D. Wende. Ditto.

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Parts concerned in Accommodation. J. W. Hulke. Quarterly Microscopical Journal, October, 1870.

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Papers on Accommodation by Adamük. Centralblatt, 292, and Woinow. reviewed in Centralblatt, 478.

On Movement of the Iris. By Engelhardt. Würzburg, Untersuchungen iv., 296.

On Intermittent Irritation of the Retina. Pflüger's Archiv, iv., 214.

Parenchymatous Keratitis, associated with Acute Rheumatism. Spencer Watson. Lancet, October 22, 1870.

Traumatic Paralysis of the Visual Accommodation. Geo. C. Harlan, M. D., American Medical Journal, January, 1871.

Does Disease of the Cerebellum lead to Loss of Sight? British Medical Journal, October 14, 1870.

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Injury to the Ciliary Nerves by a Blow. Mr. B. Carter. Lancet, December 3, 1870.

Three Cases of optic Neuritis. Mr. B. Carter. Lancet. November 5, 1870.

Zur Aetiologie und Prophylaxis der Myopie. Dr. Kämpf. Allgemeine Wiener Zeitung, Nos. 2–3, 1871.

The Ophthalmoscope in the Treatment of Epilepsy. R. A. Vance, M. D. New York Medical Journal, February, 1871.

Remarks on Divergent Strabismus. By Ed. G. Loring, M. D. American Medical Journal, April, 1871.

Account of a Severe Ophthalmia caused by Exposure to the Intense Light reflected from a Dazzling Surface of Snow. W. H. Gardner, M. D., U. S. A. American Medical Journal, April, 1871.

Paralysis of the Ciliary Muscle from Diphtheria. J. Hutchinson. Lancet, January 7, 1871.

Nævus of Orbit, Excision, Recovery. Mr. S. Lawson. Lancet, January 28, 1871.

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A New Operation for Entropium. J. McGraith. Medical Times and Gazette, March 25, 1871.

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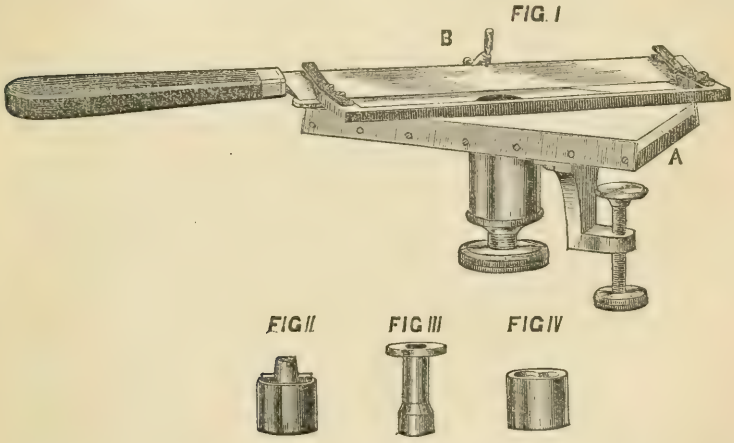
AN APPARATUS FOR CUTTING MICROSCOPIC SECTIONS OF EYES. By Edward Curtis, M. D., of New York.

So-called "section-cutters," or "microtomes," of various kinds, have long been used by working microscopists for cutting thin sections of substances intended for microscopical examination. The advantage of these instruments is, that by their use more extensive sections can be obtained, and that too with greater certainty, and less waste of material than by the usual method of cutting by hand. Hence, the special occasions when a section-cutter comes into play are the following: First, when it is desired to get an unbroken section of considerable extent to show the mutual relations of comparatively distant parts; secondly, when a number of sections are wanted from a scanty amount of valuable material; and thirdly, when, as may be the case for various reasons, it is desired to cut into available sections the whole of a given area of tissue.

Now, all three of these considerations often peculiarly obtain in the microscopic examination of morbid eyes. For, in the first place, when we remember the complex structure of the eye, and the close physiological connection in it of anatomically dissimilar parts, it is plain that the study of regional pathology is often of the greatest importance, as in cases of tumor, or traumatic lesions. And, in such cases, the advantage of having extensive microscopical sections, that will show all the tissues of a diseased region *in situ*, is obvious. In the second place, the number of similar sections that can be cut through any part of special interest in a morbid eye is, of course, small, so that, if duplicates are wanted,

there is no material to waste. Thirdly, many lesions of the eye are so minute and scattered, that, to be sure of getting sections that pass through them, it is often necessary to cut the whole of a given area into sections, and examine these seriatim.

To secure these advantages, I have been at some pains to obtain an apparatus that should enable me if possible to cut sections, when needed, of an entire eye. None of the section-cutters supplied by dealers being of the right size to hold a whole eye, I had one made large enough to do so, and to this I have added various accessories, so that the whole forms practically a new piece of apparatus, which, from its successful working, I have thought worth describing. The apparatus is shown in the accompanying woodcut. It con-



sists of the part *A* (Fig. 1), for holding the object to be cut, modelled after a form of section-cutter in common use; and of the cutting part *B*, after my own device, composed of a long straight knife held in a frame. The holder, *A*, consists of a heavy brass plate, faced with glass, six inches long by three and three-quarters wide, from the centre of which is sunk a hollow cylindrical barrel, one inch and three-quarters in depth, and one inch and one-quarter in diameter, inside measurement. Through the bottom piece of this barrel (which unscrews for convenience) works a screw-shaft, fur-

nished with a large milled head. The threads of the screw are fifty to the inch, and the circumference of the milled head is marked off into eighths, so that, if desired, the thickness of the sections cut can be measured. Attached to the under surface of the face-plate, near one end, is a screw clamp for fastening the apparatus to the edge of a table, so as to leave both hands of the operator at liberty to work the cutter. The principle of this "holder," as it might be called, is very simple. The object to be cut is first embedded in a cast of wax and oil, or paraffine, made to exactly fit the bore of the barrel; this mass is then pressed into the barrel, pushed upward by turning the milled head of the screw-shaft until it projects slightly above the level of the face-plate, when the projecting part is cut off by a sweep of the knife. Another turn, or fraction of a turn, of the milled head is then made, and again the projecting portion is cut off, this time as a smooth, even section of microscopic thinness. For a cutter, I had a straight knife made with a blade eight inches long, one and a quarter inch wide, and three-twentieths of an inch thick at the back, and with the sides concave like a razor. This I at first used by itself, sweeping it over the surface of the holder in cutting the sections, but I found that, from the length and thinness of the blade, it was apt to bend under pressure, and so fail to cut an even section, and also that the edge soon got dull from friction upon the face-plate. To obviate these difficulties, I conceived the idea of having the knife fixed in a frame, which should answer the double purpose of holding the blade stiff, and carrying it with the edge raised slightly above the level of the surface of the holder, so that the under surface of the arms of the frame should be the bearing surface upon the holder, and the edge of the knife be allowed to touch nothing but the tissue to be cut. The design of the frame will be seen at once from the figure; it is made of brass, and the knife is pushed into place from behind, under a couple of springs, which hold the blade down, and, when pressed home, the knife is kept from slipping back by a little fastening which is pushed against the back of the blade and then fixed by a turn of a quick screw. Besides the advantages of the frame in holding the knife stiff, and keeping its edge from

scraping over the surface of the holder, its weight and broad tread make its sweep much more steady and true than that of a light knife used by itself.

Such is, in brief, the mechanism of the apparatus, and I may remark, as proof of its efficiency, that I can often cut with it sections of an entire human eye, thin enough for microscopical examination. In preparing the tissue and cutting the sections, however, there are one or two points which it is necessary to observe in order to get the best results. To make these clear, it is, perhaps, best to detail the whole process of manipulation, although this is essentially the one in common use in preparing sections for examination in oil of cloves, or mounting in balsam or varnish. Supposing the object to be a morbid eye, this must, *immediately* after enucleation, be put into Müller's fluid,[1] and there left for at least three weeks. It is then cut open with a sharp knife or razor, and the halves soaked in water to remove the bichromate. This will take one or two days, the water being often changed. Such portion as is intended for cutting in the section-cutter is then to be further hardened in alcohol. In doing this I prefer to put it first into alcohol and water, half and half, for a couple of days; then into alcohol of full strength for an equal time, and then into absolute alcohol. In this last fluid the piece stays until hard enough to cut; the time required varies with different specimens, but is generally, with eyes, at least several weeks, as a very thorough hardening is necessary when the section-cutter is to be used. When ready for cutting, the piece is transferred to oil of cloves,[2] where it is allowed to stay until thoroughly impregnated with the oil: this takes from half an hour to several hours, according to the size and solidity of the specimen. The piece, however, must not be left indefinitely in the oil, as this slowly stains tissues an indelible dingy yellow, increases their index of refraction, so that the sections will look semi-opaque, even in Canada balsam, and may ultimately even spoil them for microscopical examination. When thoroughly soaked in oil of cloves, the

[1] Bichromate of potash, 75 grains; sulphate of soda, 25 grains; water, 6 fluidounces.

[2] The light-colored samples are best for use in microscopy.

piece is to be embedded for cutting. For this purpose two menstrua have been principally used, a mixture of white wax and olive-oil, in about equal proportions, and paraffine. I had been in the habit of using the former, although it has many disadvantages, having found paraffine, though in other respects preferable, too hard and brittle to cut well. My friend Dr. William Thomson, of Philadelphia, however, lately told me that he got excellent results from paraffine thinned with kerosene, its natural solvent. This I have tried, and have also used oil of turpentine and benzine for the diluent, and from what experience I have had I am now disposed to prefer thinned paraffine to wax and oil. Its most important advantage is that, so far as my experience goes, an accidental infiltration of the tissue with the melted paraffine itself is not so apt to ruin the sections for subsequent carmine-staining, as is a similar impregnation with wax and oil. The mixture I use is about one part of oil of turpentine or benzine to twelve or sixteen of paraffine. The embedding is easiest done as follows: In order to get a mould for the paraffine, which shall yield a cast of the right size to go into the barrel of the section-cutter, a solid brass plug (Fig. 4 of the woodcut) one inch high, and made to exactly fit the bore of the barrel, forms part of the apparatus. In one end of it an oval excavation is countersunk, to let the cast of paraffine take a firm hold of its surface, and to keep the same from turning round under the pressure of the knife. A strip of letter-paper, about two inches and a half wide is now wrapped tightly around this plug, the plug being in the middle of the strip, so that the paper projects at both ends. The part projecting beyond the flat end of the plug is folded down over it, and the opposite projecting cylinder of paper then forms a cup, with the excavated face of the plug for a bottom, of the exact calibre of the barrel of the section-cutter. Into this the melted paraffine is to be poured. A capsule containing paraffine or wax and oil, in considerable excess of the amount required for the embedding, is held over a lamp until the mass is just melted, when it is taken off and the piece of tissue dropped into it, and stirred about for a few minutes to rinse off the excess of oil of cloves. Then some of the melted material is

poured into the paper mould, the piece of tissue immediately transferred to the same, arranged in proper position, and the whole set aside to cool. The hardening may be hastened by standing the mould in a basin of water, the water, of course, not being allowed to come over the top. When perfectly cold and hard, the paper is unwrapped, care being taken not to loosen the paraffine cast from the brass plug, and cast and plug together are then pushed into the barrel of the holder, and each section is cut by a single sidelong sweep of the cutter. It is usual in cutting sections to flood the surface of the tissue and the blade of the knife with alcohol, so that the section, in cutting, floats freely over the blade. In this apparatus, however, from the great length of the knife, and from the fact that its edge is raised off the surface of the holder, this procedure is impracticable; but I find that I get even more perfect sections by the plan of cutting dry—that is, without flushing the surface of the tissue with any fluid. It will be seen in the figure that the knife is set at a slight angle in the frame; and this obliquity seems to give the section a tendency to curl away from the knife-blade in the cutting, so that in this dry process there is not only no more, but there is actually less danger than by the wet method of the section clinging to the blade in the cutting, and so getting torn. But here the preliminary impregnation of the tissue with oil of cloves is essential; for, were it in alcohol, the microscopically thin section would instantly become ruinously dry as soon as cut. The oil of cloves, however, from its very slight volatility, keeps the tissue of the section moist until it can be transferred to a fluid. But it will not do so long, and, hence, the moment a section is cut, it should be promptly seized, and dropped into fluid; and, if, from imperfect impregnation before embedding, the surface of the cut tissue looks dry, it should be *moistened* only by a touch of a camel's-hair brush dipped in oil of cloves. If the sections are not to be stained, they are dropped into turpentine as soon as cut; this dissolves the adhering wax or paraffine, very promptly if slightly warmed, and the sections are then ready for examination or mounting. If they are to be stained, they are put into alcohol instead of turpentine. This in a few minutes dissolves

out the oil of cloves, and the sections are then put at once into the carmine staining-fluid. For this I much prefer the solution of carmine in borax and water to the ammoniacal solution, and I obtain the best results from an intense staining in a strong solution,[1] and subsequent prolonged decolorizing with oxalic acid. Using the solution given in the foot-note, the sections are left in it for from half an hour to one hour, or until they are uniformly stained of a deep, purplish crimson. The staining-fluid is then poured off, and, *without any washing at all*, a saturated solution of oxalic acid in *water* is poured on. This instantly precipitates the dregs of the carmine in the dish, and changes the color of the sections to a bright scarlet. As soon as it has done so thoroughly, it is poured off, and a little fresh solution added. In this the sections are allowed to steep until the color is discharged from all but the cellular or protoplasmatic elements of the tissue. This takes, as a general rule, about as long as the original staining, but the time varies with different tissues; hence it will not do to trust to any rule, but the sections should be watched and the proper moment seized for stopping the action. This can, after a little practice, be told from the naked-eye appearance of the sections, but, if there is any doubt, one of them may be taken out and examined under the microscope. When the desired effect is produced, the oxalic acid solution is poured off, and the sections washed in several changes of water. They must not, however, be allowed to soak in water for any length of time, or the bright-scarlet color produced by the action of the acid will fade to a dingy purple.[2] If intended only for examination, the sections, after rinsing in water, are to be soaked in alcohol for a few minutes, then in absolute alcohol for another few minutes, then in turpentine (best slightly warm) till the alcohol is displaced and the fragments of wax

[1] Carmine, half a drachm; borax, two drachms; water, four fluidounces.

[2] The usual process is, after staining, to wash off the excess of the staining-fluid with alcohol, then treat with a saturated solution of oxalic acid in alcohol, and then wash from this again in fresh alcohol. From the great amount of alcohol thus consumed, I was led to try the water-process detailed above, and from comparative experiments I find it gives identical results with the alcohol process, and is, it is needless to remark, infinitely cheaper.

or paraffine still clinging to the sections are dissolved, when they may be examined either in turpentine or oil of cloves. If intended for permanent preservation, it is safest to let the sections, after the rinsing in water, soak for a few hours at least in alcohol, to thoroughly remove all traces of oxalic acid. Then, after passing through absolute alcohol and turpentine, they are ready for mounting in Canada balsam, or dammar, or other turpentine varnish, as may be preferred.

Such is the process to be followed in preparing sections with the use of the section-cutter, when the sections are intended to be examined in oil of cloves, or mounted in a turpentine menstruum. But it must not be understood as implied that this tedious process is to be followed as a matter of routine in all examinations of tissues where sections are required. Such is far from being the case, but to detail the various processes used in histological microscopy is not within the scope of this paper.

The woodcut represents two accessory pieces of apparatus that have not be enalluded to. These do not come into play in using the section-cutter for cutting eyes, but, as they make the instrument complete for other purposes, it is well to describe them here. Fig. 3 represents a secondary barrel with a half-inch bore, which can be screwed into the bottom-piece of the main barrel to diminish its size when any small pieces of tissue are to be embedded. It has a plug made to fit it similar to the large plug of the main barrel. Fig. 2 is a simple and ingenious contrivance, devised by Mr. Wale, the maker of the instrument, for holding hard substances which will bear squeezing, and which, therefore, it is not necessary or desirable to embed, such as cartilage, horn, wood, etc. It consists simply of a brass plug, made to fit the barrel of the section-cutter, hollow, but with the bore slightly conical, and with a screw-thread cut on its face. A few wedge-shaped pieces of soft wood of different sizes, roughly whittled out, complete the apparatus. Supposing a stick of wood is to be operated on, it is grasped between two of the wedges of the right size, being allowed to project somewhat above their tops, the whole pressed firmly into the conical bore of the plug, and with a turn or two the soft wood of the wedges is

tightly grasped by the screw-thread of the plug, and the object to be cut, tightly jammed between the wedges, is immovably fixed. Sections can then be cut from the projecting portion in the usual way. It may be remarked, in passing, that the cutter for anatomical tissues must not be used for hard substances. For these a strong, heavy knife or chisel of less brittle temper is to be employed.

In conclusion, it may not be amiss to state that the section-cutter and accessories can be obtained (to order) of the makers, Messrs. Hawkins and Wale, physical-instrument makers, Stevens Institute of Technology, Hoboken, New Jersey. Price $30.00, or, without the knife-frame, $20.00. The knife is a simple affair and can be made by any first-class manufacturing cutler from the dimensions given above. Mine was made by Mr. A. Eickhoff, 381 Broome Street, New York, price $3.00.

27 Washington Place, New York, *September*, 1871.

GENERAL SYPHILITIC INFLAMMATION OF THE EYE.

By Francis Delafield, M. D., of New York.

It is well known that the introduction of the syphilitic virus into the system is frequently followed by inflammation of different portions of the body. The inflammations due to this cause are simple, hyperplastic, or produce a cellular new growth, to which the name of gummy tumor is usually given.

The eye is very frequently the seat of these various forms of inflammation. The iris and choroid are the portions which are most frequently attacked. The inflammation is simple, or forms small cellular new growths.

In rare cases, however, the inflammation becomes general; iris, choroid, ciliary body, retina, sclera, and cornea, are involved, and the production of new cells is so great that staphylomatous tumors of large size are formed.

The literature of such cases is scanty.

Arlt describes two cases of anterior staphyloma produced by syphilitic new growths from the edge of the iris and ciliary body; but no anatomical examination of the eyes was made.

Von Hippel (Graefe's Arch., XIII., 1) gives a full description of a case in which the iris, choroid, sclera, cornea, and retina, were involved, and a large staphyloma formed.

Two cases of this character have come under my observation:

Case I.—A negro, aged twenty-two, was treated in February, 1866, for primary and secondary syphilis. In the following April, his left eye became inflamed, red, with an abundant catarrhal, but not purulent, secretion. The sight of the eye, after this, became gradually worse and worse. In June, severe pains in the eye and temple supervened, increasing at

night. These pains continued up to the time of extirpation. In October the eye projected so much that the lids could not be closed. The conjunctiva was much thickened, and the cornea could hardly be distinguished from it. The eye looked as if it were the seat of an intraocular growth, which was pushing the cornea forward.

On October 20, 1866, the eye was removed by Dr. H. D. Noyes. It had been kept for several days in glycerine before I received it.

There was an annular staphyloma at the junction of the cornea and sclerotic around the entire circumference of the cornea. The sclera preserved its proper shape up to the edge of the staphyloma. The edges of the cornea were carried out with the staphyloma so that the anterior surface of the cornea was nearly flat.

The staphyloma was filled with a new growth, partly white and partly black, which also extended backward a short distance into the cavity of the globe.

The iris had disappeared in the new growth. The lens also could not be seen.

The choroid was thickened throughout, especially anteriorly by an increase of its normal pigment-cells.

The ciliary body was much thickened. It consisted of fibres, small round, oval and fusiform cells, and pigment cells; its anterior portion was continuous with the growth filling the anterior chamber. This growth near its attachment to the ciliary body was firm and composed of fibres, with round, and fusiform cells; near its centre it was softer, the cells more numerous, and many of them broken down.

The retina was detached in a funnel shape; its anterior edge was attached at the ora serrata, but was involved in the new growth. It was too much altered by the glycerine for minute examination. The retina was pressed together by a firm, hard clot situated just behind the tumor.

The cornea was infiltrated with great numbers of lymphoid cells. The anterior elastic lamina was intact and the anterior epithelium but little changed. The posterior elastic lamina had disappeared, and the posterior portion of the cornea was ragged and irregular, composed entirely of cells. Although

the growth in the anterior chamber was in apposition with the posterior surface of the cornea, it was not continuous with it.

The conjunctiva around the cornea was thickened by lymphoid cells beneath the epithelium.

So much of the sclera as formed the wall of the staphyloma was infiltrated with cells.

Case II.—The eye was removed by Dr. H. D. Noyes from a negro, aged twenty-four. In the spring of 1869 the patient contracted a chancre, which was followed, in two months, by secondary symptoms. He was first seen in November, 1869. At that time there was a large ulcer on the penis. He said that, twenty-five days before, a piece of his finger-nail accidentally got into his left eye and remained there about two minutes. A week after this the eye became painful and red, and a week later the right eye also became inflamed. When he presented himself, in the left eye the cornea was hazy; at the lower and inner margin of the cornea there was a staphyloma of the sclera; there was complete posterior synechia of the iris, with exudation in the anterior chamber; the conjunctiva and sclera were hyperæmic; tension was normal; there was bare perception of light.

In the right eye, the cornea was hazy; there were posterior synechiæ at the lower and outer edge of the pupil; the anterior chamber contained exudation; the conjunctiva was hyperæmic; he could count fingers. February 15, 1870, the right eye had improved. The left eye became more painful and began to protrude, until the lids could hardly be closed.

March 2d.—The left eye was removed.

The eye was divided by a section passing through the apex of the staphyloma.

The staphyloma was situated in the sclera opposite the junction of the ciliary body and choroid. The staphyloma and the anterior half of the globe were filled with a white mass. The sclera as it approached the staphyloma was pushed outward, thinned, and finally lost in the new growth. That portion of it which formed the staphyloma contained many lymphoid cells between its fibres, and at the apex of the staphyloma the fibres disappeared, and nothing but cells could be seen.

The conjunctival epithelium was but little altered. Around the staphyloma the stroma of the conjunctiva was much thickened and infiltrated with cells, its vessels were distended with blood.

The anterior chamber was filled with a blood-clot.

The iris was thickened; in its stroma were lymphoid cells and coagulated fibrine; the pupil was closed.

The choroid over the fundus was normal. As it approached the staphyloma it became thick and of a gray color. The thickening was due to the presence of lymphoid cells and coagulated fibrine. Near the apex of the staphyloma all the normal elements of the choroid disappeared, and nothing but round cells could be seen. No changes could be seen in the pigmented cells of the choroid, except that they had disappeared.

The ciliary body was everywhere thickened and filled with cells. Its periphery extended into the staphyloma, and was continuous with the new growth there.

The lens was small. Its capsule remained, partly filled with broken lens-fibres.

The retina was detached in a funnel shape; its anterior portion was lost in the new growth.

Of the white mass, which filled the anterior portion of the globe and the staphyloma, the anterior portions were composed of lymphoid cells, with a scanty stroma of connective tissue, the posterior portions of coagulated fibrine entangling cells.

These two cases differ both in the situation and character of the lesion. In the first case, the new growth has more of the character of a permanent new growth than of an inflammatory product. It is composed entirely of cells, in some places arranged in a thick fibrous stroma. The new growth originates in the iris and ciliary body, and fills up the space formed by the protrusion of the cornea. At the edge of the cornea the sclera is infiltrated and softened with cells so as to form an annular staphyloma.

In the second case, on the other hand, the growth is more distinctly inflammatory. The new cells are mixed with a plentiful exudation of fibrine. The iris and ciliary body are but little affected, while the choroid is involved over a considerable area.

12 West Thirty-second Street.

THE HALO ROUND THE MACULA LUTEA. By Edward G. Loring, M. D., New York.

The actual demonstration of any new physiological or anatomical fact, however trifling, is, of a necessity, both of interest and value. Any sincere attempt to make such a demonstration, even if unsuccessful, may be of some future if not present advantage. It is with this hope, at least, that I now offer the following remarks:

The explanations of the glittering ring seen round the region of the yellow spot with the ophthalmoscope, as given by Liebreich, Schweigger, Schirmir, and others, have never been accepted by physiologists as conclusive; and Mauthner, in his recent work on the ophthalmoscope, brings an exhaustive review, of the many attempts to solve the problem, to a close, with the assertion that the phenomenon cannot be accounted for on anatomical grounds with the knowledge of the part now in our possession.

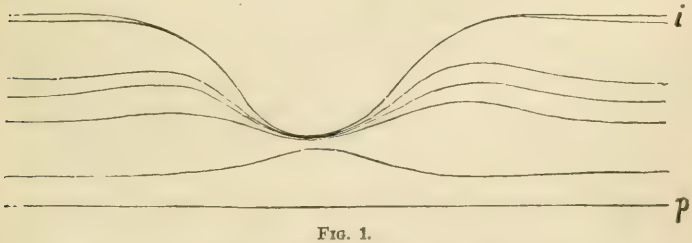


Fig. 1.

On looking at some drawings of the region of the macula, by Max Schultze, one of which I now reproduce in a diagrammatic form[1] (Taf. vi., Fig. 1), it occurred to me that the

[1] The outlines and curvature of the different layers are fac-similes of Schultze's original drawing. The scale is here, however, reduced one-half; *p* represents the pigment epithelium, and *i* the nerve-fibre layer.

effect in question might be produced by the same causes within the eye that often produce it in other places in nature, or, in other words, that it might be the products of reflexion and refraction from the combination of curved surfaces which enter into the construction of this portion of the retina.

As you will see, this region, as figured in the diagram (Fig. 1), bears in its formation a strong resemblance to a shallow cup, of which the rim is represented by a convex and the bowl by a concave surface. If we look upon these curved surfaces as mirrors, they would each have their foci, one lying behind the other in front according to their respective degrees of curvature. And if light should be thrown perpendicularly against such a combination of curves, the apex of the outside rim or convex surface would, from well-known optical laws, appear illuminated, while the inside or concave surface would appear more or less in shadow. Thus we should have the effect of a darker centre, surrounded by an illuminated edge.

In order to demonstrate this in its application to the retina, two eye-phantoms or cameras were made, precisely alike in every respect. At the bottom of one a concave metal mirror, belonging to an ophthalmoscope, was placed to represent the retinal surface. Another mirror, precisely like the first, was then taken, and a very slight depression made in it by carefully pounding down the region immediately about the hole in the centre, with a rounded chisel-handle. As the implement was made of wood, a shallow indentation was made without cutting into the substance of the mirror. This was placed at the bottom of the second camera, and represented, in a rough but sufficiently exact way, the cup-like cavity shown in the drawing, as belonging to the yellow spot. The two cameras were then examined with the ophthalmoscope.

The first gave a perfectly distinct image of the mirror at its bottom, exactly as we should expect to see it, with the hole in the centre, with clearly-defined edges; but in the second camera the hole was surrounded by a brilliant circle, corresponding exactly to the limits of the depression, while the central portion seemed to be somewhat in shadow. An idea, although a very rough one, of the effect can be formed from the

following diagram, in which *A* represents the camera, in which the mirror had been left in its natural condition, and *B* the one in which the slight central depression had been made.

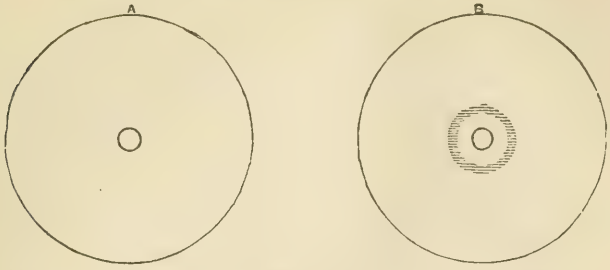


FIG. 2.

In showing this experiment to a *confrère*, I was told that, striking as it was, it could not embody the right explanation of the affair, inasmuch as there was, in fact, no such depression of the entire region of the macula as I had been led to suppose from Schultze's diagram; that the only depression in the whole surface of the retina was confined to the fovea itself; and that this, as was self-evident, was entirely too small to give so extensive a reflex; and, finally, that Schultze's figure was merely a diagrammatic representation of the fovea very much enlarged.

If this is true, then, of course the experiment, and with it the explanation, falls to the ground; and it cannot be denied but that Henle distinctly states that the only depression in the whole surface of the retina is just at the fovea centralis itself. But it is by no means so certain that the excavation pictured by Schultze is meant to represent only that of the fovea, or that it is an exaggerated and diagrammatic representation for the mere purposes of explanation. On the contrary, he states distinctly that "all the layers, excepting the rods and cones, are copied exactly from a section through a normal human retina; the drawing, as here represented, shows the macula lutea without plica, *consequently as it actually is in life*" (*loc. cit.*, p. 109).

Schultze has given, too, the scale on which the drawing was made, namely, an enlargement of one hundred and ten times. If we now measure, in his diagram, the extent of sur-

face on the retina which is stained yellow, and which it is to be supposed was meant to represent the extent of the region of the macula lutea, we find it is 158 millimetres. This, reduced to the normal size, would give for the measurement of this region 1.4 millimetre, which corresponds to the average dimension, as determined by the majority of observers. Again, if we suppose that Schultze meant the depression to be confined solely to the fovea, and under this supposition we measure the distance across the actual mouth of the cavity as figured in the diagram, we find it is equal to 110 millimetres, which, reduced, gives an actual size of 1.0 millimetre, which is five or six times as large as it is in the normal eye, so that it is not possible that the cup-shaped depression is meant to represent nothing but the fovea. There can, indeed, be no doubt but that Schultze meant to give in his picture an exact counterpart of this region of the retina as it really is in nature, and, if so, there is no reason why the conditions represented in the experiment should not be a sufficiently exact imitation of those in the actual eye.

It must be conceded, however, that Schultze's views and Henle's are diametrically opposed. Can it be that this cup-like depression varies in different eyes, both as to extent and depth, so that in some it shall be limited to the fovea alone, and in others extend, getting shallower as it goes, even up to or near the boundary-line of the entire macula? This would account for the presence of the ring in some eyes, and its absence in others, and its frequent and not inconsiderable variation when present in size and shape.

Bearing in mind that at the macula lutea the nerve-fibre layer ceases to exist as such, and that the nerve-fibres make a peculiar bend here, it occurred to me that a difference in level might be occasioned, which, varying in different cases, might still be sufficiently marked in many eyes to give the effect in question.

In order to show how slight an inequality in surface would produce the phenomenon, and to determine whether it could be possibly produced by the above condition, the following experiment was made:

A piece of thin and perfectly pure tin-foil, such as dentists use, was selected, and its thickness carefully measured

under the microscope; this was found to be only $\frac{1}{700}$ of an English line. A flat, circular disk of plane glass was then prepared. A small, circular hole was next cut in the centre of a piece of the foil, which was left somewhat larger than the disk of glass. This latter was then covered with the foil by carefully folding the surplus quantity over the edges of the glass till the surface of the foil was gradually worked perfectly tight and smooth, so as to give finally much the appearance of a flat, thin button, covered with silver, and having in its centre a circular hole, through which the glass was visible. As the thickness of the foil was $\frac{1}{700}$ of a line, the depth of the hole in the centre must be the same.

A second piece of foil, having, however, no hole in its centre, was now stretched as above, over the first covering, and the surface was then gently rubbed till the upper covering had moulded itself under the pressure into the hole in the covering beneath.

The effect of this was to give a perfectly smooth surface, with a very slight depression in the centre. The depth of this depression, even if it was equal to that of the hole itself before the second covering was put on, could not be more than $\frac{1}{700}$ of a line, but it must be in fact much less, as it is evident that the depth must decrease with each covering. The disk was then fitted to a camera and observed with the ophthalmoscope just as in the former experiment, and with precisely the same result. The glittering ring, marking the boundary of the depressed region, was present in a marked degree, and showed a very striking resemblance, both in size and appearance, to that seen in the actual eye.

We have taken, it must be borne in mind, the depth of the depression as $\frac{1}{700}$ of a line, a difference in level which seems almost inappreciable, and which is, in fact, three times less than the thickness of the single layer of epithelial cells between the retina and choroid. Now, as the nerve-fibre layer is, at the distance from the optic disk, corresponding to that of the macula, $\frac{1}{50}$ of a line thick,[1] we should, even if we took the lowest estimate, have tissue enough in the thickness

[1] Ritter. Wecker's Études, t. ii., premier fascicule, p. 51.

of the nerve-layer alone to make a depression fourteen times as deep as that which produced the effect in the phantom.

And, if for any reason whatever, such as the bending or overlapping of some of the fibres as they enclosed the macula, and the ending of others concentrically around it, a difference of level of even the slightest degree was formed, then the effect might be produced through the nerve-fibre layer alone, without taking into consideration the thinning of the other layers of the retina at this place.

But it may be said that if this difference of level did exist, it ought, however slight it might be, to be seen with the microscope. This we readily admit ought to be the case if we could get sections of the part as it really exists in nature, but it must be borne in mind that it is almost hopeless to do this, on account of the distortion of the part by the formation of the so-called plica at almost the very moment the eye is opened, and this too, letting alone the disturbance of the tissue which would necessarily follow by even the most delicate manipulation, and letting alone, too, the minor difficulty of even getting a section directly through this region.

It must, too, be admitted that, with all the labor and talent which have been expended on the anatomy of the retina, we still know little about that of the nerve-fibre layer in the region of the macula. Under these circumstances may not the ophthalmoscope have a voice in explaining a phenomenon which is in strict accordance with physical laws, and which, outside of the eye, can only be so explained ?

How far the peculiar arrangement of the anatomical elements of the different layers which enter into the construction of the part, and which go to make this inequality of level, contributes to the effect, we will not attempt to determine; it is the difference of level itself which we would insist upon as the essential factor in the production of the phenomenon.

There are one or two additional points which go to prove that the effect is due to difference of level, one of which is the fact that we often get a reflex of precisely the same character along the vessels ; and we know from the microscope that these often project, though still covered with the nerve-fibres, above the level of the retina.

A second argument in its favor is the peculiar reflex seen at the fovea centralis, with the *upright image*, first pointed out by Coccius, and the usual shape of which, as you are aware, is that of a horseshoe, which changes from side to side according to the movements of the eye.

Now, we know that the fovea is described by most anatomists as a narrow fossa with pretty sharply-descending walls, and the shape of the reflex is just such as would come from a narrow-mouthed pit; for, while one side was turned so as to catch the light and reflect it, the other edge would be turned so that no reflex would come back from it, consequently we should have a crescent or half-moon-shaped reflex, changing its position as it really does with every movement of the eye.

The reflex of the fovea, even when present, is not, however, always of a crescentic shape, for it sometimes has the appearance as if it were only the segment of a small circle which was illuminated, or as if the fossa were a triangular one, and light were reflected from only one side of it, in which case the reflexion streams out something like the tail of a very minute comet; again, it has the appearance of a delicate phantom-like veil stretched, in part, or entirely, across the fovea; and, then again, there is no reflex at all, and the fovea looks like a small yellow dot, varying in size and shape, and has the appearance as if it had been flecked directly on to the surface of the retina with a brush.

May not these differences in effect of the reflexion, when present, be due to variations in anatomical construction of the part, and principally to differences in shape and depth of the excavation; and, when the reflex is absent, may not its absence be due to the want of any difference in level?

These are questions which the anatomists must answer, but one thing is certain: where there are such marked variations in effect, there must be also marked variations in cause.

In regard to the fact which Mauthner emphasizes as so curious and unaccountable, that we only get the halo round the macula with the inverted image, and never, under any circumstances, with the upright, I have only to offer in explanation that we should bear in mind that the apparent diameter of the region of the yellow spot, under the enlarge-

ment of the upright image, would be, on the average, about one inch, which is much too large for the entire circuit to be in view at once; and furthermore that, do what we will, the illumination with the upright image is never so strong, or so concentrated on a small surface, as with the inverted.

But I would add, while admitting Mauthner's statement as almost a law, that occasionally I have got a distinct but very faint segment of reflection which I could make play about in that portion of the retina where I imagined the boundary circle of the yellow spot should be.

A SCHEME TO AID IN EXAMINING AND RECORDING CASES OF FUNCTIONAL TROUBLE OF THE EYE. By Dr. Henry D. Noyes, New York.

For about eight months I have been using a printed form in keeping records of cases of functional troubles of the eye. I found such a device desirable, to insure regularity and completeness in the examination, and for convenience in preserving notes. I have been able to put my records in a form which admits of easy reference and classification, and in doing this have secured the minimum expenditure of time.

In framing a blank for this purpose, I have included only certain classes of cases—viz., those which came under the designation of asthenopia, using the word in its widest and former significance. I thus include errors of refraction and of accommodation, and muscular disturbances.

It may not be deemed needful in every patient to ascertain all the data for which the scheme makes provision; and, on the other hand, there may be many noteworthy facts in addition to what are provided for. In the one case, certain items in the scheme will be left vacant, and, in the other case, the filled-up blank may be used as part of a full account of a case. The plan has commended itself to my use both for utility and convenience, and I venture to explain it for the benefit of any who may choose to adopt it, or may find it suggestive of some more perfect form.

I may remark that I have kept notes of one hundred cases by this method.

The blank form[1] is as follows:

Diagnosis.

.....18.....

M.....

Refraction. R. V. = L. V. = *Both.* =

Accom. = Relative A. at....in. = $\frac{+}{-}$

Muscles.

Adduct. at.....in. = °: with v. d. at...in. = °
" with....at....in. = °: with v. d. and...at...in. = °
Abduct. at.....in. = °: with.....at...ft. = °
" with....at....in. = °: with v. d. and...at...ft. = °
Linear deviation at....in. = : at.....ft. =

Ophthalmoscope.

History and Treatment.

The explanation of the above is as follows:

I put the diagnosis at the top to serve as a title for reference; then comes the date, and then the patient's name, occupation, age, nativity, and I often add weight.

The first inquiry respects the state of refraction in each eye singly, the letters R and L standing for right and left, and the space beyond serving to record the number of the glass needed to correct distant vision, if any be required. This applies to astigmatism as well as to other errors. The letter V designates the visual acuteness conferred by the glass. I sometimes find the sight, with both eyes together, sensibly more acute than with one alone, and indicate it after the word "both." As a sample of this kind, I quote the following:

R. = — 8 spherical—48 cylind. axis 155° v = $\frac{20}{30}$
L. = — 8 spherical—48 cylind. axis 155° v = $\frac{20}{30}$ Both = $\frac{20}{20}$?

The last interrogation-mark shows that, while with both eyes vision was better than with one, the difference was not

[1] The actual schedule occupies a larger sheet than is allowed by the size of this page, and a copy is enclosed for trial; more may be obtained from the publishers.

equal to one gradation of Snellen's test-type; patient could read some letters of Snellen xx at 20 feet, but not all of them. A patient who needed no correcting-glass would be marked E. for emmetropia. If, in making this examination, a solution of atropia has been used, the letters *a t r* may be put into the space.

The next step in the inquiry relates to the capacity for near vision, in other words, the function of accommodation—which is indicated by an abbreviation of the word. The relative accommodation may also be subject of examination, and the blank means what positive and negative glasses can be worn in reading Snellen $1\frac{1}{2}$ at a certain number of inches. Thus, for a given case, a patient of seventeen years old, the record stands: Accom. $= \frac{1}{4\frac{1}{2}}$. Relative A at 8 inches $= \frac{+20}{-18.}$ He has myopia $\frac{1}{36}$, and the test of accommodation is for both eyes together.

I take up next in order the function of the muscles of the eyes—the power of adduction and abduction—as tested by prisms.

Beginning with adduction, the first point is, what is the strongest prism, with horizontal axis and angle inward, which the interni can overcome, the test-object being at a specified number of inches distant? The next line below provides for a few cases in which a positive or negative glass may be requisite in testing the adduction.

On the right half of the line may be recorded what happens when a prism with vertical axis causing "vertical diplopia" (v. d.) is placed before one eye and the test-object at a specified distance. In such a case, a patient may be able to overcome a prism with its angle inward, and keep the two images perpendicularly over each other. The fact and the number of the prism are stated by putting down the number of the prism with the positive sign + prefixed to it; thus, adduction with v. d. (vertical diplopia) at 14 inches $= + 8°$. If unable to overcome any prism with vertical diplopia, but simply preserving equilibrium of the muscles, it is stated by writing $= 0°$. But, if the vertical diplopia is likewise crossed diplopia, and, to bring the images to perpendicularity, requires a prism before one or both eyes, with its angle outward, this fact is denoted by writing $= - 10°$. This

means that, for the distance of the test object, there is a degree of *insufficiency* of the interni, expressed by a prism of 10 degrees. By using the sign + to express positive power, and the sign — to denote defect of power, the long word "insufficiency" may be avoided, while the fact can be clearly expressed. Sometimes positive or negative glasses may be added in making this test, and that the line beneath provides for, viz., adduction with v. d. and (— 12 or + 16, for instance) at 12 inches = — 6°, which means that, when these glasses are worn, there appears an insufficient adduction of 6 degrees.

It may be well here to describe the way which I have found most convenient for making these examinations. I have had a light frame or apparatus of wood made, whose plan was adopted from one of the simple forms of stereoscope. If one of these stereoscopes, which carries the picture in a transverse bar, sliding up and down a central stem, should be supplied, in addition to its prisms, with receptacles for slipping in two pairs of glasses, the thing I use in examining the function of adduction would be made. The stem on which the test-object slides is eighteen inches long, and is marked off in inches and half-inches, the measurement being from the face of the patient. There are slits, or pockets, for two pairs of glasses, besides the prisms. Two pairs of glasses are provided for, so as to permit the use of a colored glass, and also of a positive or negative glass. The prisms are held by little brass catches, and easily slip in and out. The whole is held by a knob underneath the stem. I find this frame more convenient than any spectacle-frame. It is available for testing the accommodation as well as the muscular power by putting on the sliding bar a card, on which type from Snellen's book has been pasted. It is very easy to slide this up and down the stem to any point, and the distance at which the print stands from the eye is at once read off on the scale. The test-object for adductive power, which has in my practice displaced others, is a white dot and line painted on a black card. The dot and line are of this form:

I prefer this to either the dot alone or to the dot with a line both above and below. The line, as I make it, enables a patient to tell

whether the false and true images are really perpendicular; by having it only on one side and short, the prism being 10° or 12°, the images are always apart from each other, and the patient is not tempted to put forth efforts at fusion of the images, which I have noticed to occur when the prolonged line of one image overlaps the other. A white image on a black surface is more conspicuous than black on white, and, when a red glass is put before one eye, the difference in the two images is instantly recognized. A case illustrating the points above set forth as to the adductive power is the following:

Mr. C. B., twenty-nine, farmer, Red Bank, N. J.:

R. +12 spherical—48 cylind. axis 70° v=$\frac{20}{20}$.

L. +12 spherical—36 cylind. axis 90° v=$\frac{20}{20}$.

Adduct. at 14 inches=36° : with v. d. at 14 inches=0°.

Adduct. at 14 inches with +7=8° : with v. d. and +12 at 14 inches =—4°.

Adduct. with v. d. and +7 at 14 inches =—16°.

The employment of convex glasses, which neutralized his hypermetropia, elicited a slight amount of muscular insufficiency, which remained latent to trials by prisms without glasses; furthermore, by strengthening the glasses so as to suspend accommodation, the relaxation of muscular energy became still more remarkable. In treating the case, glasses which corrected the refractive error relieved the pain, and have been satisfactory for six months. In cases of myopia and muscular insufficiency, it is often needful to learn the state of adduction with concave glasses as well as without them.

Investigating *abduction:* the first inquiry is simply its amount at the usual reading distance without glasses, then its amount with glasses at the same distance. The next is abduction with parallel visual lines, that is, at twenty feet, and after this at the same distance when vertical diplopia is produced. These inquiries furnish a full exhibit of the state of adduction and abduction from which to draw suitable therapeutic deductions.

"*Linear deviation*" at a short distance—three or four inches—is obtained by concealing one eye while the other

fixes on an object at the given distance in the median line, and, after removing the screen, by measuring in the lower lid the number of lines which the previously-covered eye has turned away from the proper line of convergence. If the object fixed upon be at some feet distance, and one eye deviates, the case becomes one of actual diverging strabismus.

In the above schedule I have not thought it worth while to consider the degree to which each eye may be implicated in the defect. If an operation is to be performed, each eye must be tested, so that, if but one muscle is to be operated on, the proper eye may be selected in case there should be a choice. Very often it is of little moment which eye should be chosen.

For ophthalmoscopic appearances no large space is designated, because usually there is not much to be described. Finally, the history of the case, other symptoms, and the treatment, may be recorded.

I file away the loose sheets in pigeon-holes, and, when they accumulate inconveniently, paste them into a letter-file with an index.

I do not pretend to submit every case of functional trouble of the eye to the minute investigation which is here laid out; such labor is impracticable, and many times unnecessary. But, when a thorough examination is to be given, a proper method is observed, and full notes are quickly taken.

73 Madison Avenue.

ON THE TABLES GIVEN BY LORING AND KNAPP TO SHOW THE DISPLACEMENT OF THE RETINA IN AMETROPIA.

By Dr. O. F. Wadsworth, Boston, Mass.

In a "Report on Ophthalmology for 1870," which appeared in the *New York Medical Journal*, February, 1871, the writer, in the course of a notice of Knapp's paper, "The Influence of Spectacles on the Optical Constants and Visual Acuteness of the Eye" (Arch. of Ophthal. and Otology, vol. i., No. 2), called attention to an apparent discrepancy between the table given by Knapp[1] to show the amount of displacement of the retina in given degrees of ametropia, and a table which had been given by Loring for the same purpose (*American Journal of Medical Sciences*, April, 1870, p. 335).

These tables may be of practical importance, as enabling us to determine with some accuracy the amount of elevation or depression of different portions of the fundus, and so assisting us in diagnosis, in cases of intra-ocular tumors, for instance. It seemed worth while, then, to determine whether any real discrepancy between them existed or not.

Loring, following Mauthner[2] in the use of a formula given by Helmholtz,[3] shows in his table the amount of displacement in certain degrees of ametropia. Knapp, using another formula given by Helmholtz,[4] shows the amount of displacement in degrees of ametropia which are corrected by a lens of a certain number of inches focal distance (positive or negative), placed at the anterior principal focus of the eye. The ante-

[1] *Loc. cit.*, p. 397. [2] Lehrbuch der Ophthalmoscopie, pp. 67, 226, 227.
[3] Handbuch der Physiologischen Optik, p. 54. [4] *Loc. cit.*, p. 56.

rior principal focus of the eye being 20.29 mm., almost exactly $\frac{8}{4}''$, in front of the second nodal point, we must therefore subtract $\frac{8}{4}$ from the number of the glasses given by Knapp to obtain the degrees of hypermetropia, and add $\frac{8}{4}$ to obtain the degrees of myopia referred to in his table. This change having been made, it is seen, on comparing the two tables, that the degrees of hypermetropia and myopia for which the calculations were made are, except in one instance, different, and the amount of the displacement given varies not more than this difference might perhaps account for, if both methods of calculation be correct. In the one instance in which the displacement for the same degree of ametropia is given in both tables; viz., M.$\frac{1}{2}$, the tables do not agree. This is, however, not the fault of the formulæ. Loring gives the displacement as 8.6 mm., and Knapp as 8.26 mm. There is here an error in Knapp's table; instead of 8.26 mm., it should be 8.72 mm. This still gives a slight difference, but it is due to the fact that Mauthner, and after him Loring, estimated degrees of M. from the first nodal point, and degrees of H. from the second nodal point; while Knapp estimated degrees both of M. and H. from the second nodal point. If the calculation be made with the formula used by Loring, estimating the M. from the second nodal point, there is no disagreement.[1]

Pursuing the investigation still further, an examination of the formulæ used by Knapp and Loring shows that they are convertible, and must, therefore, with the same premises, give the same results.

Knapp, by means of the formula—

$$a_{\prime\prime}\, t_{\prime\prime} = \frac{(d - f_{\prime\prime})\, \phi_{\prime\prime}}{d - \phi_{\prime} - f_{\prime\prime}}, \text{ calculates } a_{\prime\prime}\, t_{\prime\prime},$$

the distance of the retina in a given eye from its second principal point.

Loring, from the formula—

$$l_2 = \frac{\phi_{\prime}\, \phi_{\prime\prime}}{l_{\prime}}, \text{ calculates } l_2,$$

the distance of the retina in a given eye from its second principal focus.

[1] There is also an error in Loring's table. The displacement for M.$\frac{1}{1}$ should be 1.06 mm., instead of 1.62 mm. as given.

Both take the schematic eye of Listing as a basis, and assume that the refractive system always remains the same.

l_2, the distance calculated by Loring, is equal to $a_{''} t_{''}$, the distance calculated by Knapp, less $\phi_{''}$, the second focal distance of the eye. Subtracting $\phi_{''}$ from both terms of the formula used by Knapp, we have—

$$a_{''} t_{''} - \phi_{''} = \frac{(d - f_{'}) \phi''}{d - \phi_{'} - f_{''}} - \phi_{''} = \frac{\phi_{'} \phi_{''}}{d - \phi_{'} - f_{''}} = l_2$$

The value of l_2 used by Loring is $\frac{\phi_{'} \phi_{''}}{l_{'}}$. $l_{'}$ denotes the distance at which the image of the retina of an eye formed by its refractive system stands from its first principal focus. On referring to the definition given by Helmholtz of the terms used by him,[1] we find that d denotes the distance at which the corrective lens[2] (the lens which renders rays coming from the retina parallel) stands from the first principal point of the eye. The image of the retina formed by the refractive system of the eye is the posterior focal distance of the corrective lens ($f_{''}$) behind the lens; and the first principal focus of the eye is its anterior focal distance ($\phi_{'}$) in front of its first principal point.

Therefore $l_{'} = d - \phi_{'} - f_{''}$, and $a_{''} t_{''} - \phi_{''} = \frac{\phi_{'} \phi_{''}}{d - \phi - f_{''}} = \frac{\phi_{'} \phi_{''}}{l_{'}} = l_2$.

[1] *Loc. cit.*, p. 56.

[2] We consider, as Mauthner and Knapp have done, that the second principal point of the lens coincides with its centre.

VARIETY OF FORMS OF SMALL PENCILS OF ASTIGMATIC RAYS. By Dr. G. Hay, Boston.

In the accompanying diagram, the lines O X, O Y, and O Z, represent three rectangular coördinate axes. The lines l and l' represent two straight lines intersecting O Z at different distances from O.

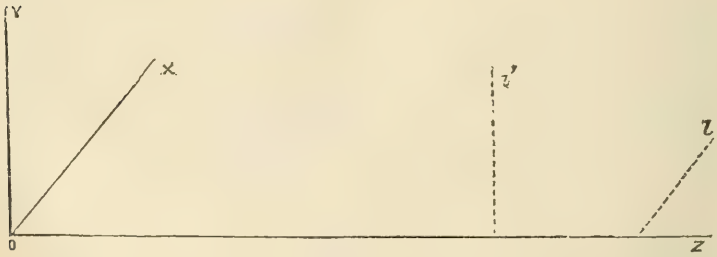


Fig. 1.

It is possible to conceive a *small pencil* of rays (straight lines), such that O Z being one in the body of the pencil, or the axis-ray, each ray intersects the coördinate plane Y X, and the two (focal) lines l and l', not only when these are perpendicular to each other and to O Z, but also for other positions of the two lines (not including, however, the case of the two being in one plane; they being supposed to intersect O Z at different points).

We might suppose l and l' each perpendicular to O Z, but not so to each other; or either or both of them might not be perpendicular to O Z. Also, instead of one of them, a curved line might be substituted.

The above appears from the following: Conceive a plane to pass through the straight line l and O Z, so that both these lie in the plane. Rotate this plane *a very little* around the

line l as an axis; it will then intersect the coördinate plane Y X in a line near to O. This line of intersection, a certain point of l', and the line l will then all lie in one plane. Accordingly, a straight line could in general pass from any point of the line of intersection just referred to, through a certain point of l' and some point of l.

By rotating the plane into other positions *quite near* to the first, we see that in general, from any point in the coördinate plane Y X and near to O, a straight line could pass which would intersect both l' and l, and also be quite near to O Z.

It is interesting to compare this conceivable variety of astigmatic pencils with the analysis given by Knapp. (*See* A. f. O., 1862.)

This method contemplates the points in which each ray intersects different planes perpendicular to the axis of the pencil. The axis of the pencil is taken as the coördinate axis O Z. The pencil is supposed infinitely small. The direction of each ray is supposed subject to a certain law, expressed by the following equations:

$$\left.\begin{aligned} x_1 &= Ax_0 + By_0 \\ y_1 &= Cx_0 + Dy_0 \end{aligned}\right\} [1]$$

In these equations x_0 and y_0 are the coördinates of the point of intersection of a ray with the coördinate plane X Y; x_1 and y_1 are the coördinates of the point in which the same ray intersects a plane perpendicular to the axis and at the distance z_1 (=1) from the origin. A, B, C, and D, are constants for any particular case. As the pencil is supposed infinitely small, any higher powers of x_0 and y_0, that might occur in the development of x_1 and y_1, are neglected.

As these equations [1] suppose that a ray which passes through the point $(x_0, y_0, 0)$ also passes through the point $(x_1, y_1, 1)$, and as for any particular x_0 and y_0 the x_1 and y_1 might each, according to the equations, be different for different values of the A, B, C, and D, we should expect that a great variety of pencils might be represented by these equations, and we have seen above that such variety is geometrically conceivable.

Assuming the equations [1], and introducing certain limitations by putting B = 0, and C = 0, it follows that each ray of the infinitely small pencil intersects two straight lines (*l* and *l'* of the figure) perpendicular to each other and to the axis; one of them in the coördinate plane Y Z, and the other in the coördinate plane X Z. This form of pencil may, for convenience, be called the typical form.

The conditions B = 0, and C = 0, limit the form of the pencil somewhat, making it like a pencil of normals to a continuous curved surface; since, with these conditions, all the rays of the infinitely small pencil, which intersect the coördinate axis X, would lie in the coördinate plane X Z, and all the rays which intersect the coördinate axis Y would lie in the coördinate plane Y Z. (For this and the preceding paragraph, *see* Knapp's Archives, vol. ii., No. 1, pp. 82–85.)

The form called above *the typical one* is also, at least approximately, the form of an infinitely small *pencil of normals* to a continuous curved surface; and this latter (pencil of normals) is the form which an infinitely small pencil of originally homocentric light has after refraction at one or more continuous curved surfaces. (*See* Helmholtz, "Physiolog. Optik.," pp. 243–247.)

The general equations [1] would be applicable to other forms of pencils of *straight lines* besides the typical one.

The conclusions arrived at by means of the formulæ given by Knapp, that there may be two focal lines *each perpendicular to the axis*, are subject to certain conditions:

1. The algebraic expressions for the distances of these focal lines from the origin must have *real* values, and not be imaginary.

2. The equations [1] must exactly represent the pencil.

These required conditions do not always exist; for, we have seen above, that cases are conceivable in which one or both of the focal lines are not perpendicular to the axis.

THE RETINA AN ASYMMETRICAL SURFACE. By Dr. Russell Murdoch, Baltimore, Md.

Any one, carefully reviewing the accepted theory of the corneal seat and asymmetrical cause of astigmatism, must feel how very inadequate such an explanation is to account for all its varieties, as well as for all the varied phenomena of those varieties. The incongruity of perfectly non-astigmatic vision with the normal asymmetrical cornea is in like manner unsatisfactory. A factor is evidently missing in both these propositions; we believe the same one in both.

The large majority of asymmetrical corneas found in the examination of the anterior surface of that structure with the ophthalmometer, and by different observers, justifies the statements that, as a rule, its form is that of "the top section of an ellipsoid with three unequal axes," and that it has its "two meridia, the vertical and horizontal; the more convex of which is the vertical." From similar numerical evidence we infer that astigmatism, with all its varieties, is the result of a variation in the curvature of those two meridia; thus, from this one phenomenon two distinct results ensue of a totally opposite character, viz., emmetropia, the most perfect vision, and astigmatism, a form of ametropia. We propose to show that, without a modification of the accepted asymmetrical shape of the cornea, these two propositions can be harmonized, by showing that a surface which is capable of compensating for the corneal asymmetry will not interfere with the known phenomenon of astigmatism, but will even supply the missing factor in the tables where the asymmetry and astigmatism are compared.

The factor we are in search of is not the lens, for the following reasons: first, the asymmetry is not described as existing in the lens in the normal eye; and even when it is present in the abnormal eye, and has been measured, it is of the irregular sort; and, second, Javal has proved that the lenticular surface is incapable of answering the requirements of a case of regular astigmatism, whence, we argue *a fortiori*, still less so as a corrective surface in emmetropia. The argument need not be repeated here; it is familiar to all. The other dioptric surfaces are all those of rotation; and an asymmetry capable of correcting that of the cornea would not have escaped notice, because, from their nature, having but comparatively slight indices of refraction, these surfaces would then have to be pronouncedly asymmetrical.

On examining the retina closely, it will be found that its internal surface is an asymmetrical one, similar and opposed to that of the cornea: a concavity where the other is convex. And here attention must be called to the stationary nature of this surface, which, therefore, is not open to the objection urged in reference to the lens; and also to its equal importance, as a factor, with that of the cornea, because situated at the opposite pole. Looking at the structure of the retina, we discover the optic nerve entering eccentrically and sending its fibres through the retina in a horizontal direction, and by two bundles, which, on separating, leave a horizontal sulcus. It is plain that these optic nerve-fibres must cause an encroachment on the vertical meridian of the ball.

It is hardly required of us to prove that the inner surface is the one which is rendered asymmetrical by the optic nerve-fibres, since it is universally conceded that the external layer is spherical. The conclusion that this surface is asymmetrical gathers weight, when we consider the function and notice the unequal distribution and irregular lengths of the nerve-fibres of Müller: they connect the inner and outer surfaces of the retina, are absent when the nerve-fibres are absent, or where the surfaces, as it were, come together, and are in greatest number and length where the nerve-fibres are thickest. The link supplied by Müller's fibres is all that is wanting to convey a non-astigmatic image (formed on the

compensating inner surface of the retina, and formed there by virtue of its corresponding asymmetry to that of the cornea) to the spherical layer of rods and cones. It would be easy, but is not necessary in this presence, to show that the retina is the first to depart from the sphere, and that the cornea is a mechanical contrivance, a sphere and cylinder combined, to correct the effects of its aberration: its greater relative functional importance is a sufficient argument. What we have undertaken to show is, that the surface which corrects the asymmetry of the cornea and produces emmetropic vision will aid in explaining many phenomena of astigmatism. The first is that, where the asymmetry at the anterior pole has been measured and compared with the total astigmatism, they did not agree; a factor, and by no means a uniform one, was found to be wanting; such a one as would be supplied by a varying asymmetrical surface corresponding to the cornea itself. Again, it is a singular fact that, although we now know that the ametropias are produced by a change of position in the posterior pole of the eye, and although we know there is a peculiar and intimate connection between different varieties of the ametropias and astigmatism, yet nothing has been as yet advanced to explain the connection. To be more explicit, the smaller amounts of ametropia are, as a rule, complicated with astigmatism; while, with the greater, such is not the rule. An explanation for these phenomena, we think, is to be found short of the poles: we believe the same surface produces both; not always, nor necessarily to the entire amount in any given case; but the above connection, which has been dignified as the rule, can only meet with an adequate explanation when the two, astigmatism and ametropia, have their origin in the same surface and are produced by the same cause.

There are six varieties of astigmatism, four of which can be explained without supposing a change of curve; merely supposing a change in position of the posterior pole. Now, by this hypothesis, emmetropia with non-astigmatic vision exists when the two asymmetrical surfaces are at focal distances. But suppose the retina is separated, so that the vertical meridian occupies the place of the horizontal one, this

latter is entirely out of focus, and we have produced the first Am. A little further extension of the ball, and we have M + Am. The other two may be produced in like manner by an approach of the retina to the cornea; first Ah and then H + Ah. It is worthy of remark that this hypothesis presumes the most distinct meridian to be the rule in all these cases, and departure from rule to be due to an exceptional cause. Our hypothesis does not ignore variation in the meridia, but makes it of secondary importance, and presumes that the variation of these is less in any given case, because two meridia are added together.

There are two other classes with their varieties—the mixed astigmatisms, M + Ah, and H + Am. With, however, two surfaces to account for these mixed astigmatisms, a certain amount of corneal curvature without deformity is presumable; but not so if it all is produced at the anterior pole. A natural division of the astigmatisms is made by some: those having a general cause and connected with a facial distortion, and those confined to the eye. Possibly it will be found that the former are more intimately connected with the change of the retinal plane, as occurs in the ametropias, while the others have the variation of curves in one or both poles of the eye, as their most important factor.

Without enlarging—and these remarks are capable of greater extension—we turn to some phenomena that admit of no other explanation than a purely retinal seat. Sometimes in testing astigmatism two equally defined and very distinct lines are seen (we do not now refer to cases where there is but one meridian); these the corneal surface alone cannot possibly produce, and, moreover, the lens is excluded because they continue during accommodation. We believe that, of these two lines, the one in rule, i. e., either the vertical or horizontal one, as the case may be, is due to the cornea, while the other, the slanting one, is produced by the retina. This phenomenon of orientation of a meridian occurs generally in slight ametropias, and, consequently, in looking for a cause, that fact must be held in view. In slight ametropias, whether H or M, the plane of the retina is on a level with the optic papilla, but with the more extensive ones the plane of the retina at

the macula is far removed. This answers as nothing else does; and we offer therefore the following explanation of the process occurring in the departures of the eyeball from the normal: The retina revolves in its plane around the eccentric optic nerve as a pivot, and consequently a meridian in focus does not remain either vertical or horizontal, but tilts.

An evanescent astigmatism, noticed by Dr. E. G. Loring, must have its seat solely at the back of the eye, because it occurs during diseases of the retina and choroid, and disappears when the disease passes away.

It is well known that all explanations which have designated the cornea as the seat of the astigmatism connected with strabismus, which passes away with the removal of the defect, have signally failed, because any explanation must consider that they are in rule. We do not claim originality in considering them as produced at the posterior pole, but we offer an explanation which we think has not before appeared, and has the advantage of an agreement with rule. For example, in internal strabismus, the internal muscle, pulling the cornea inward, stretches the external muscle which hugs the whole of the outside of the eye; the optic nerve, rigid and unyielding on the other side, forms at the posterior pole a vertical sulcus; and a vertical sulcus behind corresponds with a short vertical meridian in front, i. e., a meridian in rule.

It may be urged that, in any case, if the ophthalmometer shows that a spherical cornea is connected with non-astigmatic vision, our hypothesis is overturned. We reply, not so, unless enough spherical corneas are found to prove it the rule; as an exceptional cornea may very naturally be connected with an abnormal retina.

Note A.—An asymmetry of the cornea amounting to $\frac{1}{68}$ cyl. lens would only require an advance of .158 mm. of the vertical meridian of retina to produce E.

Note B.—A species of orientation in which the optic nerve revolves around the macula, instead of the macula around the nerve, can be seen by comparing the eyes of the sheep, cat, and man. This revolution is, moreover, connected in the two first-named animals with the well-known change of direction of the stenopacic pupils, while in man, where the optic papilla holds an intermediate position, the pupil is round; but the cornea, as I think I have shown, accomplishes by its asymmetrical nature the same connective agency, but with a better cosmetic effect.

LETTER FROM DR. G. HAY, OF BOSTON.

In conformity with the vote of the Ophthalmological Society, I beg leave to send to you the following, which I also send to Dr. Murdoch.

What I objected to was the view that an astigmatism, caused by an asymmetrical cornea, could be corrected by an asymmetrical retina.

According to my notion of the matter, if an astigmatism existed in consequence of an asymmetry of the cornea, then a pencil of rays proceeding from a *single point* of the object, say the point looked at, would, when arrived in the vitreous, be an astigmatic pencil.

From such an astigmatic pencil, which has no point-focus, the retina could not receive a point-impression, but only an impression extending over a certain surface, or a linear-shaped impression; and this, although the pencil proceeded from a single point of the object.

This being the case, even if the retina became asymmetrical, it could not reduce to a point-impression the surface-impression or line-impression made by the astigmatic pencil, that is, it could not correct the astigmatism. The impression on the retina would not be materially altered by the proposed change of shape of the retina.

This is the essence of what I intended to say at the meeting.

Very respectfully, G. HAY.

Dr. NOYES, Secretary American Ophthalmological Society.

DR. MURDOCH TO DR. HAY.

DEAR DOCTOR: In reply to your much-esteemed favor of the 27th ult., I beg to say that we do not differ in that "a pencil of rays proceeding from a *single point* of the object, say the point looked at, would, when arrived in the vitreous, be an astigmatic pencil." Yet I cannot see that my position is altered by limiting the extent of surface, as you propose, for we are dealing with a pencil in either case, and, as long as we are so obliged to do, we obtain extension in two directions, and consequently have neither point nor line.

The most important position is your second, and there I entirely dissent from you, because a linear-shaped impression can only be formed by a purely cylindrical surface, and the cornea is a combination of sphere and cylinder, the former in much greater proportion (an asymmetrical cornea, you will grant me, differs from our sphero-cylindrical combinations only in having them both on one surface). Now, as, in the perfect camera, we oppose a convex sphere with a concave, and thereby correct spherical aberration, so I conceive that an analogous correction is effected in the eye by the opposition of a concave cylindrical element to the convex.

I am, etc., RUSSELL MURDOCH.

DR. HAY TO DR. MURDOCH.

DEAR DOCTOR: I beg leave to acknowledge the favor of yours of the 3d ult. It is rather difficult to compare views by writing, but I should like to add a few words in explanation of my first note.

In the first place: I took up the case of a single pencil from a single point, thinking in that way to simplify the matter, because what we have to deal with is, I suppose, a collection of such pencils; one from each point of the object. And my idea was, that, if a proposed remedy would not correct a single astigmatic pencil, the same remedy would not correct a collection of such pencils.

Again: You write, a "linear-shaped impression can only be formed by a purely cylindrical surface, and the cornea is a combination of sphere and cylinder," etc. If we combine a plano-convex lens about $\frac{1}{2}$ $\frac{3}{4}$, with a simple concave cylindrical $-\frac{1}{8}$, putting the two plane surfaces together, and placing the combination at about eight feet from an Argand gas-burner, burning rather low, we can get a linear-shaped illumination on a card placed at right angles to the course of the rays of light, the lenses being also similarly placed.

At one distance of the (white) card from the lenses we get a linear illumination in one direction; and at another distance of the card, a linear illumination at right angles to the first.

The linear character of the illumination may be made more marked, as follows: Let the light burn higher; put a screen before it, with a small hole, about $1\frac{1}{2}$ or 2 lines in diameter, placed opposite the brightest part of the flame; bring up the lenses to about four feet from the light.

I think the experiment is quite *à propos* to the question at issue. I shall be glad to know how it appears to you. Yours, etc. G. Hay.

DR. MURDOCH TO DR. HAY.

Dear Doctor: The combination you suggest is equivalent to two cylindrical lenses of unequal foci ($\frac{1}{2}$ $\frac{3}{4}$ C ⌴ + $\frac{1}{4}$ $\frac{1}{4}$ C nearly) at right angles to each other.

The foci appear straight, because they fall on a plane surface, and are seen *en face;* but are arched, both in the direction of their long and short diameters: thus ◡, ◡.

I do not think that the experiment is appropriate, nor can I in its place suggest a spectral one, on account of the impossibility of grinding an asymmetrical surface which can oppose such a combination as that of the normal cornea. I can only suggest a subjective experiment, which to my mind is equally convincing: please make yourself slightly As., say Am. by $\frac{1}{4}\frac{1}{2}$ cyl., and observe either Green's test-plates, or a candle-flame, placed at 20′, and ask yourself what surface will *passively* correct the As. Will it not be a similar one in kind to that which would *actively* correct the astigmatic rays before they enter the vitreous? To me the impression is that of an undulating surface, requiring an undulating or *cylindrical* surface to produce a uniformly distinct image, etc.

Yours, etc. Russell Murdoch.

AN ADDITIONAL METHOD FOR THE DETERMINATION OF ASTIGMATISM.

By Dr. George Strawbridge, of Philadelphia.

I think it will be readily admitted that a simple, quick method for the determination of astigmatism is something very much to be wished for, but as yet not reached; and, with this end in view, I submit the following method, based on an experiment described in "Helmholtz's Optics," page 107, to wit:

"If the light from a gas-lamp, or from the sky, be allowed to pass through a small round opening in a screen, such a light will appear, to an eye not exactly accommodated for it, as a star, with light radiation proceeding from it in various directions; now, if a diaphragm is pushed slowly from the side so as to pass gradually in front of the eye, it will be observed that this 'light figure' begins to be *shaded*, and on the *same* side *from which the diaphragm was moved*, if the object is *farther* removed than the *point* for which the eye is *accommodated*, but from the *opposite* side, if the object is *nearer* than the point for which the eye is accommodated."

The reason of this will be readily seen by examination of the figure on the following page.

Rays of light proceeding from point a, after passing through lens b, will unite at point C, and on the retina $E\,E'$ a sharp image of the object will be thrown. But, suppose the eye to be hypermetropic, and the retina to be at $H\,H'$, then, instead of a sharp image, circles of dispersion will be formed of a diameter represented by $p\,q$. If in this circle we individualize the two points, $p\,q$, which are met by the light proceeding from a, as a result, the individual, under these cir-

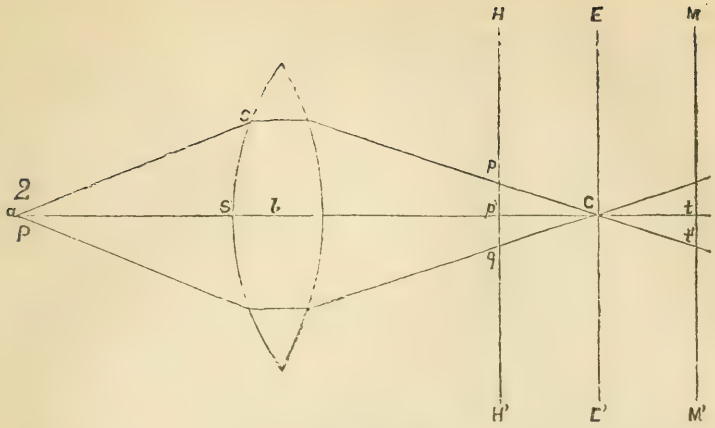


FIG. 1.

a, Light-point in space; *b*, Refractive media of eyeball; *C*, Focus of lens, *b*; *E E'*, Position of retina in emmetropic eye; *H H'*, Position of retina in hypermetropic eye; *M M'*, Position of retina in myopic eye.

cumstances, will consider that the upper point *p* in the retina represents the image of an object situated in the field of vision below the real light-point *a* (as *P* in diagram), and the lower point *q*, of an object *above* the real light-point (as *Q* in diagram); following the rule that images on the retina are inverted, and a lower-situated object corresponds to a higher-situated image on the retina.

Now, it will be readily understood that, by cutting off the rays of light as in the section *S S'* by a diaphragm, if the eye is *hypermetropic*, the semicircle of light-dispersion, *p p'*, on the retina *H H'*, will be intercepted; while, if the eye is *myopic*, the semicircle of light-dispersion, *t t'* on retina *M M'*, will be intercepted, and to the observer the effect will be, if hypermetropia exist, that the lower half of the light-circle at *a* will first vanish; while, if myopia exist, the upper half of the light-circle will first disappear as a consequence of the position of the images on the retina.

With these preliminary remarks, I proceed to describe the method of examination:

In the centre of a Bristol-board, a round aperture of thirteen millimetres diameter is cut, and at a distance from the aperture of six centimetres radiate bars, cut in the Bristol-board, having a length of nine centimetres, and width of five

millimetres, and forming an angle with each other of ten degrees. Over this figure, white gauze paper is passed, and a lamp, placed behind, illuminates it in its entire extent.

The patient is placed at a distance of twenty feet from the figure, and requested to observe the round central opening, and to notice in what direction it is most elongated. This is readily determined by observing to which of the bars in the figure the light-prolongation most closely corresponds in its direction, and the result will be controlled, as to its accuracy, by also finding which of the bars are most distinctly seen. For example, in a case of myopic astigmatism in the vertical meridian, it would be found that the light-elongation would be upward and downward, and at the same time the vertical bar would be most distinctly seen.

By this procedure the *direction* of the meridian is discovered. The next step is to determine the *refraction* of the *meridian*.

To this end a diaphragm is advanced in the direction of the greatest elongation of the round light (suppose it to be vertical, and that the diaphragm moves from above downward), and the patient is requested to notice whether the upper half of the round light first disappears or the lower half, as the diaphragm moves downward; if the upper half is first gone, the meridian is shown to be so curved as to cause a *myopia* to *exist*.

While, if the lower half of the round light is the first to disappear, we conclude that a hypermetropia exists.

If the entire round light is found to disappear at once, it may be concluded that very little astigmatism exists.

The direction of the meridians being now known, as well as their refraction, whether normal or so curved as to cause a myopia or hypermetropia, the next step would be to determine exactly the *amount* of *abnormality*.

To this end we proceed with spherical glasses, determining the exact one necessary to see distinctly the proper bar, as in the method laid down by Snellen.

Advantages of this method:

1. Simplicity. The usual methods are, as a rule, so complicated that the patient often becomes confused in the ex-

amination, and an error can easily result; but to this new procedure no such objection can be made.

2. Accuracy, which results from the extreme delicacy of the test formed by illuminated bar.

3. The great saving of time, arising from the fact that the mode of examination can be conducted so much more quickly than by the ordinary methods.

4. This method allows of examination being made entirely independent of daylight, and so obviating any inconvenience arising from defective illumination found in cloudy weather, etc.

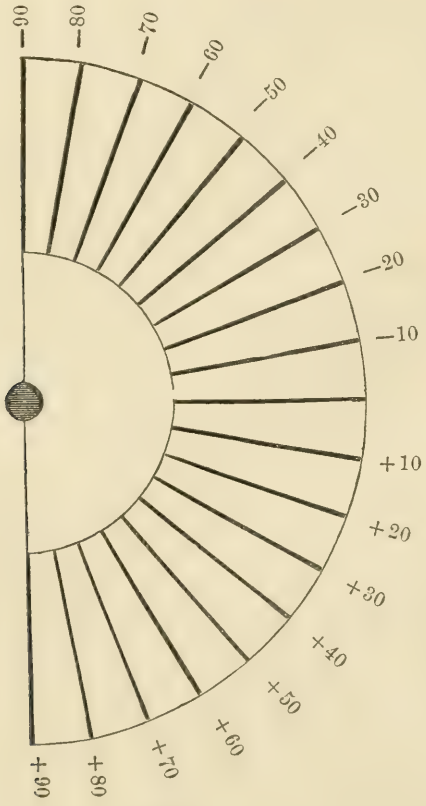


Fig 1

The above represents the figure used in this method of examination. The black circle and broad lines represent the central round aperture and bars, which are illuminated by a light placed behind. To Dr. John Green, of St. Louis, I am indebted for the idea of arranging the bars, as radii of a circle.

ON ASTIGMATISM AS AN ACTIVE CAUSE OF MYOPIA.

By John Green, M. D., St. Louis, Mo.

In a paper published in the *American Journal of the Medical Sciences*, for January, 1867, I called attention to the fact that persons known to be myopes prove, upon careful examination, to be in a large proportion of cases also the subjects of astigmatism, a fact which suggested to me the possibility that, in many of these cases, the astigmatism stood to the myopia in the relation of cause to effect. I purpose now to study this relation in the light of recently-published statistics of astigmatism, taking for comparison my own series of cases, reported to the American Ophthalmological Society in June, 1867, and July, 1868,[1] and the much larger series published by Snellen, in connection with the Tenth Annual Report of the Netherlands Ophthalmic Hospital, in 1869.[2]

Snellen's tables comprise all the cases of astigmatism which occurred in the Utrecht clinic and consultation rooms during the years 1864–'68; 278 patients are enrolled, presenting 498 astigmatic eyes, 18 myopic, 8 hypermetropic, 9 emmetropic, and 23 blind or very imperfect eyes. My own cases, as published, include 48 patients with 84 astigmatic eyes, 4 myopic, 4 hypermetropic, 2 emmetropic, and two imperfect or blind eyes, making, with Snellen's cases, a total of 316 patients with 582 astigmatic eyes.

Of these 582 astigmatic eyes, in 318, or 54.6 per cent., the refractive anomaly was by excess (myopic astigmatism), and

[1] Transactions of the American Ophthalmological Society, Fourth and Fifth Annual Meetings, Niagara, June, 1867, and Newport, July, 1868.

[2] Het tienjarig bestaan van het Nederlandsch gasthuis voor ooglijders. Met wetenschappelijke bijbladen. Utrecht, 1869. Also, Archiv. für Ophthalmologie, Band XV., Abtg. 2.

in 264, or 45.4 per cent. by deficiency (hypermetropic astigmatism), the percentage being almost exactly the same in the two series of observations. Both Snellen's and my own measurements were made, for the most part, without using atropia, and must be taken as showing the manifest rather than the total refractive defect; in many instances, therefore, we may assume that the accommodation was but partially relaxed, and that some cases really of Ah. or of Ahm. have been recorded as Am., or possibly even as M+Am. But, applying an approximate correction for this defect in the observations, we may still conclude, with a good degree of probability, that the cases of Am. and M+Am. are not less numerous than those of Ah. and H+Ah.

When we analyze the statistics of compound astigmatism we find the proportion of myopic to hypermetropic eyes much greater than in the aggregate of all the forms of astigmatism, while the source of error just noticed is almost if not quite eliminated. Thus we have from Snellen's tables, of—

M.+Am.	128 cases, or	61 per cent.
H.+Ah.	81 " "	39 " "
	209	100

From my own list we have, of—

M.+Am.	39 cases, or	53 per cent.
H.+Ah.	33 " "	47 " "
	72	100

Combining the two tables we have, of—

M.+Am.	167 cases, or	59.4 per cent.
H.+Ah.	114 " "	40.6 " "
	281	100

These data would seem to afford a fair basis for the assumption that there is more than an accidental connection between myopia and astigmatism. That such connection should exist is, moreover, not only quite probable, but the opposite condition would seem to be, on the whole, improbable.

Admitting, with Donders, that hypermetropia is the expression of an inherited conformation of the eye, while myopia is ordinarily the result of a pathological distention of the globe, we are irresistibly led to the conclusion that most of the cases of M.+Am. may have been originally cases of sim-

ple or possibly of mixed astigmatism. So also some of the cases of Am. and Amh. may be only instances of myopia superinduced upon Ahm. or Ah.[1]

To deny this is to assume that astigmatism when conjoined with myopia is to be considered as acquired, while we regard simple astigmatism and astigmatism conjoined with hypermetropia as congenital.

It only remains to point out how astigmatism can act as a cause of myopia, and this seems sufficiently obvious. The effect of reading and study of books, in originating as well as in aggravating the grade of myopia, has been clearly pointed out by Cohn, of Breslau, who has called attention to two very important elements of mischief in schools, viz., insufficient or badly-arranged illumination, and bad construction of desks, compelling the scholars to bend their heads over their books.

Exactly analogous to the effect of insufficient light, in compelling the child to hold his book nearer than would otherwise be necessary, is the operation of any other cause which tends to impair the distinctness of vision. Such a cause, and a most efficient one, we have in astigmatism, and we need but reflect upon the amount and kind of book-work which is demanded of our school-children, to find in even moderate grades of astigmatism an almost irresistible incentive to read under high degrees of convergence and with strong exercise of the accommodation. In astigmatism the injurious effect of insufficient illumination, too, must be far greater than in emmetropia, inasmuch as the normal compensation in the enlargement of the pupils is rendered unavailing through the consequent diminution in the distinctness of the retinal images.

Researches undertaken upon large numbers of myopes, with a view to establishing the degree of frequency with which astigmatism is present as a complication, are, so far as I know, still wanting.

[1] The recent careful investigations of F. Erismann, upon 4,358 school-children of St. Petersburg, seem to prove, beyond a doubt, that large numbers of eyes originally hypermetropic pass through the stage of emmetropia, finally to become myopic—and this as a direct result of long-continued straining of the accommodation and convergence in study. (Archiv. für Ophthalmologie, xvii., i.)

REMARKS ON CATARACT. By Edward G Loring, M. D., New York.

Mr. President: As you are well aware, it has long been recognized that astigmatism often occurs as a disturbing element in the vision of patients who have been operated upon for cataract. Thus, Dr. Knapp, in Graefe's *Archives* for 1867, observes, that "we should not neglect to test eyes, which have been operated on for cataract, with cylindric glasses, to see if vision is not thereby improved. This is found to be the case in a marked degree, where the result has been a good one, in about one-fourth of the cases. Thus, I have found, where V. = $\frac{1}{4}$, corrected it will be $\frac{1}{2}$, and V. $\frac{1}{3}$ will become $\frac{2}{3}$, and so on."

But notwithstanding this knowledge of its existence, very little has been done by the majority of operators in determining the degree of the error in refraction when making out their statistics of vision, and still less has the attempt been made to remedy the defect by prescribing suitable glasses.

This latter is no doubt due to the fact that the necessary sphero-cylindric glass is so heavy and of so awkward a shape as only to be worn with great discomfort to the patient. Thus, if we wished to give a spherical glass, for example + $\frac{1}{4}$ combined with a cylindric glass, the spherical surface, inasmuch as it would have to be put all on one side, would have to be ground on a radius of two inches. This degree of curvature would, in order to fill the eye of the spectacle-frame, require the glass to be very thick in the centre, the apex of which would consequently project a good deal from the plane of the rim of the spectacle, while the slight curvature of the cylindric surface would hardly project at all. Such a glass as this is necessarily very heavy, clumsy, and uncomfortable.

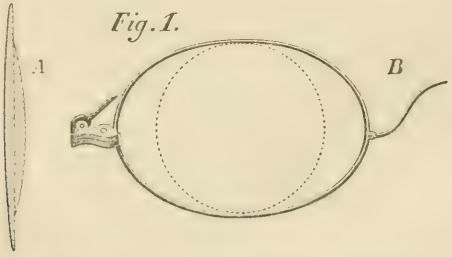
With the hope of remedying these objections, so as to allow us to give astigmatic glasses to cataract-patients, I have contrived the glass which I now present to the Society, and which is made in the following manner:

A simple cylindric glass of the required strength is first set in the spectacle-frame in the usual way, the axis of the glass of course running in the required direction. A thin plano-convex glass is then ground, and, taking advantage of the fact that lenses can be cemented together by Canada balsam, this is firmly fixed by its plane surface to the back, or plane surface of the cylindric glass.

As the diameter of the plano-convex is made only equal to the vertical diameter of the spectacle-frame, and not to the longitudinal one, it follows that a large quantity of glass is thus dispensed with, and the weight of the glass is thereby much lessened, the two combined lenses being in fact, when nicely made, only one-fourth of the common spherical cataract-glass as found in the shops.

In the figure, *A* gives a longitudinal section of the glass, the dotted line marking the line of union between the two

Fig. 1.



lenses, while *B* shows the front view of the glass as it appears in the frame, the dotted line here showing the circumference of the plano-convex glass. As you will observe, the edge of the convex lens is so delicately ground and so perfectly fitted to the cylindric glass that the point of union is barely perceptible when the glass is worn, and the peculiarity of its construction would escape the notice of any but a very observant eye.

The pair which I now offer as a sample has a spherical surface of $+\frac{1}{2}$ (really equal to a biconvex $+\frac{1}{4}$), and a cylin-

dric surface $+\frac{1}{12}$ C, the patient being astigmatic to that degree in the vertical meridian. With the best correction with spherical glasses, vision equalled $\frac{1}{4}$; with this glass it rose to $\frac{1}{2}$.

The chief objection which would be raised against glasses made in this manner would, in all probability, be on account of their liability to come apart. Whether this is a valid objection remains to be proved. I would say that this pair has been in constant use for four months, and in that time they have been dropped twice; once in a crowd, from which they were only rescued after the frames had been considerably bent. They certainly show no signs of separation between the two lenses, and we know that the lenses of telescopes and opera-glasses are subjected, oftentimes for years, to the extremes of temperature and hard usage, without showing such a tendency, and, even if the glasses should occasionally separate, it is certainly a simple matter to recement them.

This slight inconvenience would be more than compensated, it seems to me, by the increased amount of vision gained, especially when, as in the present case, it is doubled.

In this connection I would remark that it seems to me that a want of uniformity now exists among operators in regard to testing the vision of cataract-patients, which has a tendency, to say the least, to create confusion not only as to the results of different operators which is of comparatively small importance, but also as to the merits of the method of operating itself, which is of vast importance.

It is almost universally considered now, after the so-called peripheric linear has been in vogue for the past eight years, and after it has been consequently thoroughly tried, that it is far superior to the old flap-operation, and this opinion purports to be founded—not as many medical opinions are—on unsupported convictions of its great originator, and a few of his most skilful disciples, but on carefully-prepared statistics, which, as they are based on mathematical principles, are of almost mathematical exactness. It is alleged that, as the basis upon which the statistics for both operations were compiled was the same, namely, Snellen's method, it follows that the comparison must be a just one, and, as the peripheric linear yielded more favorable results, this was the better operation.

From this opinion, prevalent as it is, we demur, and believe that, although the method of testing was the same, yet the standard used was different, and that, consequently, the conclusions drawn are not only unreliable but even erroneous, and that, so far as statistics go, it is at least still a question whether the old flap, and not the new peripheric linear, does not give the best results.

To show that this is the case, reference must be made to the statistics themselves.

In 1863 Graefe published the results of 1,500 cases of flap-extraction.[1] Out of these he got 65 per cent. of immediate good results, with 15 per cent. additional after a secondary operation, making 80 per cent. as a grand total of perfect success. In these cases, "vision of at least $\frac{1}{4}$" is taken as the standard necessary for a good result. In patients over seventy-five years, however, V=$\frac{1}{6}$ is allowed. There was a total loss of from 5 to 8 per cent.

In a later paper, however,[2] Graefe gives another series of cases, in which he gets 84 per cent. of perfect results, 11 per cent. of half successes, and a total loss of 5 per cent., and he then states that, in his private practice, the results were even better than this, namely, 91 per cent. of perfect results, 6 per cent. of half successes, and only 3 per cent. of absolute loss. Ninety-one per cent. of patients, with vision $\frac{1}{4}$ and over, and only 3 per cent. of total loss, is a result which we venture to say has never been equalled by any other method.

If we now turn to the peripheric linear, we find at the outset that "Graefe, as Dr. Norris says,[3] has not given us so extended and full an analytical report of his cases as would be desirable," but he did publish 300 cases (*Archiv.*, xii., part i., p. 151), in which he got 90 per cent. of perfect immediate good results. But here, instead of taking vision $\frac{1}{4}$ as a standard, he took $\frac{1}{6}$, and we have no means of knowing how many cases were included between V = $\frac{1}{4}$ and V $\frac{1}{6}$. But, if, for the sake of calculation, we take the differ-

[1] Zehender, Klin. Monatsblät., p. 146, 1863.
[2] Archiv. für Ophthal., vol. xi., part iii., p. 7, 1865.
[3] Hay's Journal, January, 1871, p. 243.

ence between $\frac{1}{4}$ and $\frac{1}{6}$, we must then subtract 9 per cent., which would leave 81 per cent. of cases with vision $\frac{1}{4}$. Graefe then goes on to state that, out of the 10 per cent. which comprises total failures and imperfect successes, enough would have been benefited by secondary operations to have given a grand total of 94 per cent. of perfect results. Admitting that this "would have been" the case, we must still take, in order to make the comparison a just one, 9 per cent. away, which would leave a grand total of 84.6 per cent. of perfect results against 84 of the second, and 91 of the third series of flap-operations. Thus we see that the balance swings, if any thing, a little in favor of the flap-operation. Whether this may be accounted for in the difference between strictly private and a mixed series of patients, it is hard to say. But what is plain is, that, even in Graefe's hands, the results of each method are so nearly equal, that it is still an open question which is the better; or, to say the least, there is no sufficient cause, so far as statistics are concerned, for the now almost universal belief that the linear is so much superior to the flap.

Were this prevalent opinion, however, founded upon Graefe's results alone, little more would need to be said; but, inasmuch as it has apparently been confirmed by those of others hardly less skilful than he, it may not be without interest to look at the statistics of these operators, scanty though they be, which have gone so far to produce this general opinion.

Thus Dr. Knapp, who is an ardent supporter of the new operation, has published three series of cases of 100 each, which are exceedingly interesting and instructive on account of their fulness of detail in regard to the amount of vision obtained.

In his first series (*Archiv.*, xiii., vol. i., p. 120), Dr. Knapp claims 62 per cent. perfect results. Here he uses, however, vision $\frac{1}{6}$ as a standard of success. If we apply that used in the flap, we find, on looking at the table, that out of the 100 cases he got only 39 perfect results, against Graefe's first and worst series of flaps, which gave 65 per cent. of *immediate* perfect successes; $V = \frac{1}{4}$.

Dr. Knapp remarks that among these cases there is 14 per cent. in which vision ranges from $\frac{1}{40}$ to $\frac{1}{200}$, and which are capable of being improved by a secondary operation. Admitting that one-half are so improved thereby as to obtain vision equal to $\frac{1}{4}$, and this is a large proportion, we then get as a final result 39+7=46 with vision $\frac{1}{4}$ and over.

In making out his second series (*Archiv.*, xiv., vol. i., p. 316) Dr. Knapp says that "he, as Graefe, and others have done," divides his cases into three classes, which, with their respective numbers in each are, as follows:

Failures 2.
Imperfect results (V=$\frac{1}{12}$ – $\frac{1}{100}$) 12.
Perfect " (V=$\frac{1}{2}$ – $\frac{1}{10}$) 86.

It will be seen from this that Dr. Knapp claims 86 cases out of the 100 of immediate good results; but here another change takes place, and, instead of taking V $\frac{1}{4}$ or even $\frac{1}{6}$ as a standard, he takes $\frac{1}{10}$, and apparently on the authority of Graefe. This may be the case, but I can nowhere find it stated in Graefe's writings that he has ever used a scale of vision lower than $\frac{1}{6}$ as a perfect result, though it is undoubtedly true, as will be seen a little later, that others have done so, and it strikes me as manifestly unjust and unscientific to maintain the superiority of one operation by statistics in which the standard of excellence used is *two and one-half times less* than in the other.

If we look at the table of specific results from which the above classification was made, we see that, out of the 100 cases, there are only 40 in which the vision is $\frac{1}{4}$ and over. That is to say, only 40 per cent. of immediate successes according to the scale for the flap-operation.

We also see that there are 12 imperfect results. Now, supposing we admit with Dr. Knapp that one-half of these imperfect results can be made perfect ones, and that, in all of these, vision can be made, not, as he says, $\frac{1}{10}$, but even $\frac{1}{4}$, and supposing we add these cases to the 40 already perfect, we get as a final result 40+6=46 cases out of the 100 with $\frac{1}{4}$ and over.

With V = $\frac{1}{10}$ Dr. Knapp makes the final result 93 successes.

In his third series Dr. Knapp has (*Knapp's Archiv.*, vol. i., p. 130):

Failures	3
Imperfect ($S < \frac{1}{10}$)	15
Perfect ($S > \frac{1}{11}$)	82

By looking at the table of specific results, we find 50 cases of immediate good results, $V = \frac{1}{4}$ and over. Admitting with Dr. Knapp that 9 out of the 15 imperfect could be made perfect, and allowing to these cases, as before, $V = \frac{1}{4}$, not $\frac{1}{10}$, which is all that Dr. Knapp claims, we get as a final result $50+9=59$ cases with $V\,\frac{1}{4}$ and over.

Making, now, a comparison between the final results of Dr. Knapp's series of cases by peripheric linear and Graefe's by the flap, we have, arranged in tabular form, something like the following:

	Knapp Linear.		Graefe Flap.
1st series	46	against	80
2d "	46	"	84
3d "	59	"	91

This averaged gives 35 *per cent.* in favor of the flap with vision $\frac{1}{4}$ taken as a standard in each case.

It may be objected that in the above calculation we have taken even a higher scale than did Graefe himself in applying vision $\frac{1}{4}$ to all cases, inasmuch as Graefe made an exception of such as were over seventy-five years of age, reckoning in these cases $V\,\frac{1}{6}$ as a perfect result.

As an offset to this, it must be remembered that we have allowed to Dr. Knapp 8 cases in each 100 with $V\,\frac{1}{4}$, when in the first series $V\,\frac{1}{6}$, and in the remaining two only $V\,\frac{1}{10}$, was claimed.

It might also be objected to as hardly fair to contrast any other operator, however skilful, with the great father of modern ophthalmology; and the above figures would go a good way toward making such an objection valid, especially as Graefe was working under the disadvantage of what is supposed to be an inferior operation. This impression will, however, be corrected, to a degree at least, when we call to mind that it has always been the custom, especially latterly, to look upon Graefe as a great medical philosopher rather

than a skilful and delicate operator, though it would certainly strike one, judging simply from the results which he obtained, that he was in this, as in all other clinical branches of our specialty, immensely superior to any one of this or any other generation.

Becker published (*Zehender*, vol. v., p. 279, 1867) the statistics of 217 cases (150 operated upon by Prof. Arlt), in which V $\frac{1}{10}$ was also taken as a perfect result; inasmuch, however, as no specific details are given as to vision, no satisfactory comparison can be made from them, except that the final result obtained was only 83 per cent. with V $\frac{1}{10}$, and over.

Dr. Derby, of Boston, a warm advocate of the new operation, has given, in an analysis (*Boston Medical and Surgical Journal*, June 8, 1871) of 61 cases of linear extraction, a tabular statement of the vision of 49 patients. Dr. Derby also reckons V $\frac{1}{10}$ and over as a perfect result, and sums up the cases as follows:

Failures	3
Partial success (V $\frac{1}{11}$ to $\frac{1}{30}$)	6
Entire success (V $\frac{8}{8}$ to $\frac{1}{10}$)	43

If, however, we reckon an "entire success" $\frac{1}{4}$ instead of $\frac{1}{10}$, we find, by referring to the table, that there are only 19 such cases, instead of 49.

If of the 9 additional unrecorded cases we assume that 5 will have vision of $\frac{1}{4}$ and over, we get as a final result 24 cases of perfect result out of 61, or 39 per cent.

There are, indeed, other statistics by different operators, all of which, however, are compiled with so little exactness, or founded upon such various and indefinite scales of measurement, as to be of little value for the purposes of comparison. Still, those which have been cited here are enough to show that the want of uniformity in the standard is a serious embarrassment in our making a just comparison, not only between the results obtained by various operators, but even of the true merits of the two methods, and this is the object which we had in view.

And in this connection I would say that I can easily understand how the younger and rising school of ophthalmologists, after having gained their experience in the old meth-

od, with all the numerous mistakes and failures incident to beginners in this difficult and exacting technic, should now obtain, after they have become proficients, better results with the linear than they did at the outset with the flap. For it is certainly easier for a practised hand to change slightly the method of operating, than for a novice to learn how to operate.

What we should like to see done would be, for those who are skilled in both methods, and who have plenty of material, to try them side by side under the same influences and with the same tests. It is only in this way that the two operations can be justly compared. But, if these conditions are too hard to fulfil, we might at any rate expect that the advocates of each method might conform to the very simple condition of using the same standard of measurement, be this what it may.

It may be said that the one originally taken by Graefe, namely, $\frac{1}{4}$, is too high, and that it was probably for this reason that he himself changed it in the linear method. Admitting that this is true, and that V $\frac{1}{6}$ is nearer the mark, the question at once arises, What are we to do, for the sake of study and comparison, with the immense number of cases carefully recorded by Graefe and tabulated under the scale of V = $\frac{1}{4}$ —cases which, from their great number and from the vast amount of instruction which they embody, form one of the most brilliant pages in the whole annals of modern ophthalmology? And, if, to suit the progressive spirit of the age in its craving for "perfect results," we go successively from $\frac{1}{4}$ to $\frac{1}{6}$, and to $\frac{1}{10}$, where, may we ask, shall the end be?

I would say, further, Mr. President, that these remarks are not in any way meant as a criticism on either operation. Had they been so, reference would have been made to many things which have not even been mentioned, and certainly to the change instituted by Graefe himself, from a wound which was entirely in the sclera to one which is two-thirds or more in the cornea, and from the slight arc latterly sanctioned by Graefe to a gradual increase in the curvature of the section, till, in the hands of many operators, both in Europe and this country, the only appreciable difference between the new operation and the

flap with a concurrent iridectomy is the difference between the old and the new knife.

The discussion of these points, as well as the final decision as to the merits of the respective operations, I feel had much better be left to those of my colleagues whose experience is richer and whose judgment riper than my own.

AN APPARATUS FOR TESTING THE PERCEPTION OF COLOR. By Henry D. Noyes, M. D., New York.

The examination of a patient's ability to discriminate colors I have found to be a time-consuming proceeding, and have been at a loss how to register the results of the examination in a graphic and satisfactory manner. To obviate in some measure these difficulties, and because I appreciate the importance of making these investigations, I have adopted some simple contrivances which I beg leave to describe.

I paste upon a circular piece of card-board the slips of colored paper which I use as tests. They are put on in sectors of the circle, and may be as numerous as is thought needful. I have divided the circle into ten sectors, and have put on it two shades of five colors, viz., red, blue, yellow, green, and purple.

This disk is covered by another whose surface is black, and whose diameter is half an inch smaller. In this top disk a notch is cut, corresponding to the size of one of the colored sectors of the other disk.

The covering disk or screen is attached to a handle, and is pierced through its centre by a pivot on which the colored disk is to rotate. The latter, moreover, has broad notches cut into its rim, like teeth in a cog-wheel, which correspond in number to the colored sectors, and are so placed as to give ready hold for the forefinger or thumb to rotate it. The whole affair looks something like a palm-leaf fan. In examining a patient, he is placed before a black-board and told to fix one eye upon a distinct mark near its centre. The color-test is presented to his view in different parts of the field just as is done usually with a bit of white chalk. The disk is held in

one hand, and by the finger or thumb of the same hand rotating the outer disk a succession of colors is presented to the patient's notice. To register the findings of the examination upon the black-board, it is needful simply to select

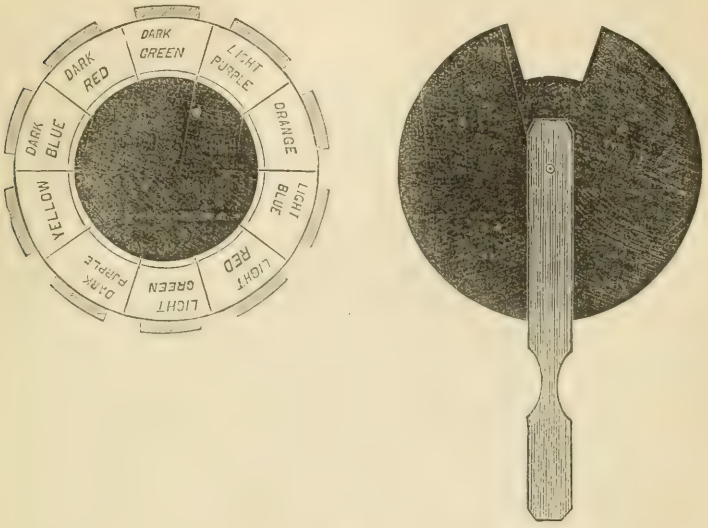


Fig. 1.

crayons corresponding in tint to the colors employed, and, with the proper chalk, mark upon the board the place where each color is perceived. The usual way of getting the visual field with white chalk is thus applied to color-tests. The method being simply to employ colored chalk in one hand to mark upon the board the spots where the colors successively exposed to his view upon the disk in the other hand are recognized. When the examination is complete, a number of colored tracings are upon the black-board, which may be transferred to a note-book, on a reduced scale, with precisely the same crayons.

DESCRIPTION OF A JAEGER OPHTHALMOSCOPE, AS MODIFIED. By Dr. George Strawbridge, Philadelphia.

The apparatus can briefly be described as follows: The body of the instrument consists of a short cylindrical tube fitted into a ring, and so arranged as to permit of rotation on its axis. At its anterior extremity, it is so cut away as to cause its anterior surface to form with the cylindrical axis an angle of 60°; on the anterior border of the tube are found two notches made to hold the arms of the reflector, and on the side of the notch is placed a small spring for fixation of the reflector. The longest side-wall of the cylinder has a length of one inch, while its shortest side has a length of two lines. The posterior end of the tube is closed by a diaphragm, having a central opening of three lines diameter; and on its posterior surface are fastened a spring-catch and axle for holding a disk in position and permitting of its rotation. To the ring, grasping the cylinder, is fitted a handle made to close in itself (as the blade and handle of a knife), and so economizing room. The ophthalmoscope contains a "strong light" and "soft light" reflector. The first is a concave glass reflector of seven inches focus. The latter consists of three plane, parallel, transparent, thin glass plates, fitted in a metal frame and so fastened that they can be easily taken apart and cleaned; between each of these glass plates is placed a thin metal ring for the purpose of preserving an intermediate thin layer of air. The apparatus contains, in addition, a convex lens of two and a half inches focal distance, fastened in a ring for convenience in holding; and, finally, twenty correction-glasses placed in three metal disks; each disk having seven openings for this purpose. The first disk, which may be called the "the working-disk,"

is divided as follows: First, an opening for observation of the eye with the reflector alone. Secondly, a convex eight glass for examination of the inverted image; and, finally, concave glasses Nos. 10, 8, 6, 4, 3, for examination of the erect image. For an ordinary examination this disk alone will generally suffice.

The second disk contains convex glasses Nos. 48, 30, 24, 16, 12, 10, 7. The third disk contains concave glasses Nos. 30, 24, 16, 12, 7, 5, 2; and it is believed that this collection of glasses will be found sufficient to determine the greater number of refraction anomalies.

The disk rotates behind the opening in the diaphragm, and by means of the spring-catch each glass as it rotates is caused to stop exactly behind the centre of the opening, and at the same time the arrangement allows of the disk being quickly removed and another substituted—on the same principle as Dr. E. G. Loring, of New York, has made use of in the construction of his ophthalmoscope, and from whom the idea was derived. The entire apparatus is contained in a box $4\frac{3}{8}$ inches long and $1\frac{7}{8}$ inch wide.

The chief advantages of this form of ophthalmoscope consist in the fact that it has the "weak light" reflector as well as the "strong light" reflector. Also, that these reflectors have two motions, one on their own axis and one on the axis of the cylinder, and so permit of great variety of position, while at the same time the correction-glasses remain stationary, thus avoiding any prismatic effect from the correction-glass. Finally, the arrangement of the correction-glasses in a disk avoids the trouble which is occasioned by adjusting each glass separately, and at the same time the collection of glasses is sufficiently large to admit of the determination of a refraction anomaly in a case where a box of glasses is not attainable.

GUNSHOT-WOUND OF THE BRAIN, FOLLOWED BY FUNGUS CEREBRI, AND RECOVERY WITH HEMIOPSIA.[1] By W. W. Keen, M. D., and William Thomson, M. D.

Case I.—Patrick Hughes, late private of Company K, Fourth Regiment, New York Volunteers; born in 1839, in Ireland; puddler both before and since enlistment; wounded at Antietam, September 17, 1862. Wound of entrance in the middle line, one and a quarter inch above external occipital protuberance—a small, depressed wound; wound of exit two by two and a half inches, its centre being two inches to the left of middle line, and three inches above wound of entrance. He fell, did not lose consciousness, but, blinded by blood, crept toward the enemy till warned by his comrades, when he crawled behind the ranks, and was carried, when faint, to an old barn, where he remained nine days. While here, his eyesight, he thinks, was poor. He was then taken to Mount Pleasant Hospital, Washington, D. C., where he lost his consciousness, and was more or less paralyzed in both right arm and right leg—whether slowly or suddenly, and whether it extended to the face, he does not remember. The paralysis and unconsciousness lasted some two or three months. He remembers having had fungus cerebri as large as his fist, which was shaved off some five or six times. When he tried to think, he often used to become almost "out of his head." His memory was so bad that, between calling the doctor and his turning to hear the question, he would forget what he desired to say. He had no aphasia. In four and a half

[1] Extracted from the Photographic Review of Medicine and Surgery for February, 1871.

months he was able to come to Philadelphia. In walking he was very giddy; noise and laughter used to hurt him badly. His mental and physical power gradually grew better, and in one year his paralysis had almost disappeared.

Present Condition, December 20, 1870.—His memory is quite good, but by no means so good as before the injury. He is rather easily bothered and confused, and more irritable than formerly. The sight of his right eye, he thinks, is poor. Whiskey affects him as usual. Sexual power undiminished. He has no paralysis. The wound of entrance (see photograph—the head was shaved in order to have the photograph taken) is marked by a slight depression in the bone, the wound of exit by a hollow two and a half by two inches, and one inch deep. No bone has closed this opening, but the scalp and hair dip down into the hollow. The arterial pulsations are barely perceptible. When recumbent, the hollow is gradually obliterated and replaced in about one minute by a rounded protuberance. To prevent pain during this change, he supports the parts with his hand. When he coughs, even with moderate force, the depressed scalp instantly bulges up in a cone, which nearly reaches the general level of the skull and obliterates the depression, and then as suddenly subsides.

The eyes, upon examination, present the following conditions: There is no ptosis on either side; entire mobility of the eyes under direction of the will; both pupils normal in size, and responsive to light. Upon the left cornea is to be seen a slight leucoma, the result of a burn from a piece of metal, received two years since. In all other respects both eyes are, in appearance, perfectly normal. Refraction of each eye is found to be emmetropic. The acuteness of vision is for the right $\frac{1}{1}$, and for the left $\frac{1}{1.5}$; the slight impairment of vision being due to the result of the burn, which caused not only slight opacity of the cornea, but also irregular astigmatism. The power of accommodation is for each eye $\frac{1}{4.5}$. There is no diplopia, and no insufficiency of either internus.

Upon testing the field of vision, it is found to be divided for each eye by a line passing through its centre, in the vertical direction—total blindness existing to the right, and per-

fect vision to the left, of this line. When, for example, the right eye is fixed upon a point of light eight feet distant, a second point of light is lost to view when it is moved one inch and a half toward the right in a horizontal line; and precisely the same condition exists for the left eye—i. e., the light is lost one inch and a half to the right of the median line. With the *right* eye it is not possible to determine the spot of Mariotte —that is, the blind spot in the field corresponding to the entrance of the optic nerve (*see* the diagram, p. 29)—since the insensitiveness of the retina in that eye commences at the inner margin of the macula lutea, and extends to the entire inner half of the retina. With the *left* eye, that portion of the retina between the optic-nerve entrance and the macula is found normal in sensitiveness; since, when at four feet the left eye is fixed upon a point of light, a second light is clearly perceived as it is moved toward the left until it has reached a point about nine inches to the left, where it is lost, to reappear at a point about thirteen inches from the first light. Beyond this point the field has its normal extent.

By ophthalmoscopic examination no pathological appearances whatever could be observed, either in the retina or at either optic papilla, beyond the distortion caused in the left eye by the astigmatism, probably of traumatic origin, as mentioned above.

Remarks.—I. This case is briefly referred to in Circular No. 6, S. G. O., 1865, at the bottom of page 15; and Dr. Otis writes us that it will be fully related in the first volume of the "Surgical History of the War," with the chromo-lithograph of the fungus cerebri. As it must first be presented to Congress and published by the Department, no opportunity was presented us of correcting the history by these notes. The history here presented, therefore, as derived from the patient, must be taken with some caution, since the wound has so severely injured his cerebrum. On all points, however, he gave very clear statements.

II. The complete recovery from paralysis (as evinced by his subseqent severe labor), and the almost entire restoration of his mental faculties, are remarkable, especially in view of the probable deep lesion of the brain, both by the primary injury and the subsequent fungus cerebri.

III. The astonishing and rapid changes in the state of the cranial contents, due to any change in position, to coughing, etc., as evinced by the effacement of the depression at the wound of exit, are worthy of note. Whether due to a flow of cerebro-spinal fluid (which would be the principal agent in a change of posture), or to venous congestion (as in coughing), the case shows that our attention has been far too slightly fixed on the medical bearings of such facts in all cases of severe cough, and on their surgical bearings in operations for cataract, etc., during the existence of bronchitis.

IV. The light thrown on the probable anatomy of the optic commissure is also worth our notice.

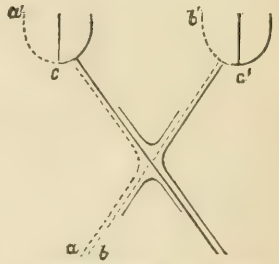


Diagram of the optic commissure and the two retinæ.—*a*, *b*, the fibres of the left optic tract supplying, respectively, the left halves of the two retinæ *a' b'*; *c*, *c'*, the maculæ luteæ.

The inter-retinal and inter-cerebral fibres are merely indicated.

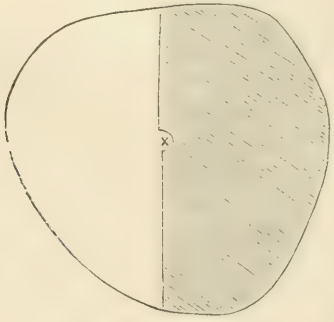
Wollaston (Phil. Trans., 1824, p. 222), reasoning from two attacks of transient hemiopsia, occurring in himself, and other cases in friends, appears to have been the first to point out the semi-decussation of the optic nerves at the chiasm. Longet ("Traité de Phys.," 2d ed., ii., 476) seems to assent to the explanation, though he refers to cases of perfect sight in which, it is asserted, no chiasm existed; and in his "Traité d'Anat. et de Phys. du Syst. Nerv.," p. 666, he gives cases of perfect sight in both eyes, in spite of unilateral cerebral atrophy or traumatic lesion. Von Graefe (*Archiv.*, ii., 286) assents cordially to Wollaston's view, admitting that he proposes nothing new, but that it is far too little known.

Hubert Airy (On a Distinct Form of Transient Hemiopsia, Proc. Roy. Soc., February 17, 1870, in *Nature*, i., 444), after a careful examination of preceding writers, also supports it; and the experiments of Laborde and Leven (*Med. Gaz.*, November 5, 1870; from *Gaz. Méd. de Paris*), who found atrophy of the right optic nerve following the removal of the superficial right cerebral convolutions, and without any apparent irritative processes, would also point in the same direction.

In our own case the point to which we desire to call special attention is the rigid optical examination of the region between the porus opticus and the macula lutea. The semi-decussation of the nerves at the chiasm being admitted, it would naturally be supposed that the fibres *a* from the left tract would supply the left retina from the porus opticus toward *a'*; but our examination shows that it supplies *less* than this, viz., only that part of the retina from *c* to *a'*; while in the right eye the fibres *b*, instead of supplying the retina from the porus opticus to *b'*, supply *more* than this, viz., that part of the retina from *c'* to *b'*. In other words, the fibres *a* and *b* of the left optic tract supply mathematically the left halves of the two retinæ from *c* to *a'* and *c'* to *b'*, and the right tract the right halves.

V. As to the cerebral seat of the sense of vision, the amount and depth of the injury to the brain are too uncertain, perhaps, to warrant us in venturing on any speculations as to its locality.

Note to Case I.—These examinations were made in the usual manner, with a black-board and chalk, with two bright points of light, and with Förster's apparatus. The man was intelligent, possessed normal acuteness of vision, and became well trained in the methods of investigation employed, and these considerations give interest to the fact that, *at the point*



Field of right eye.

of fixation, the vertical line which bisected the field seemed to deviate slightly toward the defective side. Above and below a horizontal line through the field at the point of fixation, the

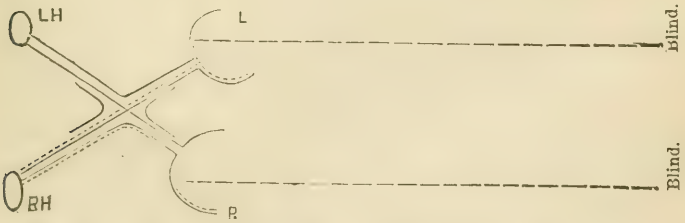
limitation was strictly vertical, while in the horizontal line, at a distance of eight feet, a moving light could be carried for one and a half inch from the fixed one before being lost to view. Due allowance must be made for the possible eccentric fixation of the patient, and for his having inadvertently *followed* the moving light for this short distance.

Case II.—Reported to the Society by Dr. W. Thomson. Joseph Rowan, aged fifty-five, disabled by partial paralysis of motion of left side, states that he had a sunstroke seven years since, and a second one three years ago. His hemiplegia is now of two years' standing. Sensation on both sides is unimpaired.

Vision. R. $\frac{1}{4}$ L. $\frac{1}{2}$ Refraction Hy. $= \frac{1}{20}$ with $+\frac{1}{20}$ Vision. R. $\frac{1}{3}$ L. $\frac{1}{2}$ $A = \frac{1}{14}$

No ptosis, nor muscular insufficiency. Right pupil slightly larger than left. By ophthalmoscope, both eyes are normal in appearance.

The field of vision of each eye is bisected by a vertical line, to the left of which there is entire blindness, as tested by the black-board and chalk, as well as by two bright points of light.



No effort was made in this instance to ascertain whether the field was limited strictly by the vertical line at the point of fixation, since the intellection of this patient seemed so far impaired as to render it impossible for him to sustain the mental effort requisite to complete so refined a subjective examination.[1]

[1] Confirmed by Dr. C. A. McCall, U. S. A., who had him in charge at the time.

DETACHMENT OF THE RETINA, WITH LACERATION AT THE MACULA LUTEA. By Henry D. Noyes, M. D., New York.

Miss Carrie S., aged thirteen, New York, was struck in the left eye, three years ago, by a cork which popped from an ale-bottle; sight was lost immediately. When the stinging pain of the blow subsided, she experienced no suffering, and no inflammation ensued. The eye has remained in the same condition, with the exception of slight divergence. There is now obtuse perception of light; pupil contracts as usual. After using atropia, ophthalmoscopic examination showed the following appearances:

The optic nerve clearly defined and normal. The retina lifted up by a stratum of fluid, which is most abundant below and to the outer side. In every part of the fundus this effusion can be discerned, but nowhere is it in considerable quantity. It is almost transparent. The detached retina can be sharply defined in the upright image by aid of a convex 10 glass, the observer being accustomed to complete relaxation of accommodation. This would give about one millimetre as the thickness of the fluid. The retinal vessels have the customary dark color and tortuousness which belong to this lesion. At the middle of the fundus the retina becomes of grayish-white color, and at the macula lutea is a round red spot of about half the diameter of the optic disk. When observing the contiguous retina with +10, its texture is clearly seen, and, besides having a slightly-granular look, it is marked by fine streaks or plaits, which radiate from the red spot. Under this inspection the red spot shows no detail, although its edge is sharply defined. But, when the red spot is scrutinized without a glass, it no longer appears as a blur, but exhibits a distinct, reddish, granular

look, and it is evident that one is looking at the epithelium of the choroid. At the same time the adjacent retina assumes a blurred appearance, because not in focus; the radiating striæ are not to be seen.

The difference in depth of these two surfaces at once suggested the idea of a laceration of the retina at the macula lutea, and that the red spot was simply a hole through which one could look upon the choroid.

Further and undeniable proof of this explanation of the lesion was found in the phenomena of parallax which were detected by slightly changing one's point of observation. In making such slight movements from side to side, the edge of the opening could be made to conceal and disclose a definite point at the margin of the bottom of the red spot. The edge of the spot was not tremulous, nor was it ragged, nor was there any tissue sloping down from it toward the spot. Critical inspection made it evident that one could look under the retina. I have no explanation to offer of the mechanism of this peculiar rupture of the retina. It is the only instance of this kind which I have ever seen or read of. This much may, however, be suggested, that at the macula the retina is thinner and necessarily weaker than at any other part, and it has a faint amount of coherence with the choroid. The perfect transparency of the vitreous forbids the idea that the retina became detached by adhesion to a shrinking corpus vitreum, and hence we must admit that the effusion was the direct result of the blow. Doubtless this fluid, which now is almost entirely transparent, was at first more or less bloody. It does not at present appear to be perfectly limpid, and Dr. F. Delafield suggested that it might be somewhat gelatinous. The doctor was kind enough to examine the eye, and was able to verify the appearances described, and could suggest no other diagnosis than that this was in truth a hole torn through the middle of the retina. So regular is it in outline, so free from traces of shreds or fringe on the edge, that it might have been cut out with scissors or made with a punch.

In no case of tearing of the retina from bursting of fluid through it have I ever seen any approximation to this shape. The rents have been linear, or curved, or tongue-like. They have usually been near the equator of the globe.

REPORT OF PASSAVANT OPERATIONS WITH AND WITHOUT ETHER, AND ALSO UNDER NITROUS OXIDE. By B. Joy Jeffries, M. D., Boston.

Since my report last year to the Society of the results of thirteen Passavant operations for breaking up posterior synechiæ or attachments of the iris to the capsule, I have successfully employed it in the following cases:

A woman has had chronic irido-choroiditis, and, as sequelæ, some four or five attachments of the iris to the capsule. Around these the pupil dilates, showing the iris-tissue to be still good. There is constant trouble from the eye, aggravated, I judge, by the dragging of these posterior synechiæ. Therefore, under ether, I broke away two that were close together at the upper side. After breaking one, and the aqueous had escaped, I found no great difficulty in pushing the point of my closed forceps between the iris and the cornea, against which it of course laid, to reach the next one close beside it. In a few days I broke another at the opposite side of the pupil, also under ether. The patient was rendered quite sick and uncomfortable by the ether, so much so that I proposed to her trying to break the next without anæsthetic. This she consented to, and I succeeded without difficulty. She did not complain of the pain as being very great, the dragging on the iris seeming to be the most painful part. That it was not severe was certainly proved by her preferring to have the fourth and last operation also done without anæsthetic. With a little care and command over the patient, I had no difficulty in holding the eye sufficiently steady. A compressive bandage was each time left on overnight. The aqueous humor is,

however, much sooner resecreted, and corneal wound closed. The patient went back to her occupation in a store, within forty-eight hours after the last operation, the eye now being hardly, if any, troublesome.

Another case was that of a man injured by the premature discharge of a blast. The face and eyes were full of powder. He had had traumatic iritis in the left eye, and atropine showed three broad posterior synechiæ. Both corneæ were so filled with powder, and the eyes in such a bad condition, that I judged it best to remove as many of the grains of powder as possible, and for that purpose kept him under ether some time, since he could not have held the globe still enough to work without. He was miserably sick from the ether, and dreaded taking it again. I therefore very gladly availed myself of the kindness of Dr. Robert Amory in offering to give the patient nitrous-oxide gas. As he has reported on the special method of administering this anæsthetic, I omit speaking of it here, except to say that, after the mouth-piece was removed, I had more than ample time to carry out my operation—time enough to have performed an iridectomy, or even a longer operation. For such short operations, not followed by pain, I regard the nitrous oxide as invaluable. Passavant's operation has to be repeated as many times as there are widely-separated attachments, and, although I persuaded one patient to submit to it seven times under ether, we shall not always be so fortunate. The posterior synechiæ were so broad in this case, and the iris possibly friable, that I did not like to attempt to break them away without an anæsthetic, for fear of the pain. The patient was perfectly satisfied with the gas, experiencing no pain whatever. A compressive bandage was kept on a few hours after each operation. The three operations have resulted in leaving a free movable iris. Spots of pigment, where the attachments were, are seen on the capsule. To what extent they will disappear I will not attempt to say. Judging from previous cases, I think all lymph will be gradually absorbed.

A man, aged sixty, has had granulations, ulcers of the corneæ, etc. The results are, central corneal opacity in the right eye, with anterior synechia, and a single posterior synechia downward in the left eye.

May 23, 1871.—An iridectomy for artificial pupil was done on the right eye, and a Passavant on the left, perfectly freeing the pupillary edge of the iris.

A man, aged twenty-three, has run through with a fearful attack of syphilis, leaving, as sequelæ, total posterior synechia and closed pupil in the left eye, and three or more attach ments in the right.

May 6, 1871.—Iridectomy downward for artificial pupil was done on the left eye, and by a Passavant the attachment below broken in the right eye. Atropine now keeps *this clear* of the capsule, although there are still two attachments above.

May 30*th*.—I made two corneal openings with a broad needle opposite the two attachments, and broke them both, one after the other. The flowing off of aqueous did not prevent my sliding the forceps between the cornea and iris without injuring the capsule. The two punctures did not cause the loss of a whole drop of aqueous fluid. This procedure, of course, saved one additional operation.

A man, aged thirty-two, has in the right eye total posterior synechia, lens opaque, iris discolored, globe soft, vision gone—the result, seemingly, of old irido-choroiditis. In the left eye there have lately been slight irido-choroiditis, and a resulting rather broad synechia downward, which was broken May 30, 1871, and the released iris gave a circular pupil. I looked upon this attachment, perhaps of old date, as a readily-exciting cause of fresh inflammation.

In these seven, and the thirteen operations previously reported, I did no harm to the capsule, and certainly improved the condition of the eye. In the second operation in the last case, owing either to the close and broad attachment, or my not grasping the iris deeply and firmly enough, it was a little torn, and a filament dragged into the wound. It, however, entirely replaced itself before the eye was bandaged, and no traces are now seen.

With Dr. Passavant, as with me, this operation has always been successful; I therefore think it proper to quote the following, from the *Medical Times and Gazette* of May 29, 1870, by Dr. Alex. Ogston, of Aberdeen, who, in referring to Dr. Passavant's article, says: "This paper of Dr. Passavant

appeared so honestly written that a trial of his method was instituted in the next case that presented itself in the Aberdeen Hospital. In this case, as in all the cases where I have tried it, the operation was followed by no bad results as regards the iris; but, though the adhesion was seen to tear, the contraction of the pupil, which invariably followed on the escape of the aqueous humor, allowed the two ends of the adhesion to lie so close to each other that they united again in spite of the free use of atropine, and by the time the corneal wound was healed the same state of matters existed as before the operation, only the adhesion was not so broad as before."

As Dr. Ogston does not minutely describe his method of operating, I can only imagine his results were due to having made a larger and more peripheric wound in the cornea than was necessary, whereby the aqueous chamber was not quickly enough reëstablished. I found no such trouble as he describes. He now operates in a different, and, as I contend, much more dangerous method, namely, he passes a not too sharp needle into the aqueous chamber opposite the point of iritic attachment, and, engaging the point of the needle in the iris tissue, forces it away to break the synechia, using the hole in the cornea as a fulcrum. The unnecessary danger of wounding the lens, and thereby producing cataract, which we must run in such a procedure, would be sufficient to induce me to hold to Dr. Passavant's method, which I have so far always found successful, and not so very difficult for those accustomed to ophthalmic operations, especially as I am now convinced it can be readily performed under nitrous oxide, a hundred gallons of which anæsthetic may be carried about with perfect safety in a case twenty inches long and eight square, as Dr. Amory has practically demonstrated.

Instead of an iridectomy-knife, I now use a broad paracentesis-needle. I find no difficulty in manipulating my delicate forceps in the corneal wound this makes, and I lose but little aqueous before the iris is grasped, when the escape of the fluid rather assists in the breaking the attachment. Atropine is continued, and the humor secretes so quickly, that there is no time for the iris to again fasten itself to the capsule. I have occasionally succeeded in not losing all of the aqueous humor during the whole operation.

CASE OF READJUSTMENT OF THE LEVATOR MUSCLE OF THE UPPER LID. By John Green, M. D., St. Louis, Mo.

Readjustment of the levator of the upper lid has been but rarely performed, and has still more rarely been followed by restoration of the proper function of the muscle. In fact, the reported cases of this operation have been, for the most part, in paralytic ptosis, where we should, *a priori*, expect least from it. In the following case the ptosis was traumatic, and the indications for operation were substantially the same as in the operation for readjustment of the internal rectus:

—— Williams, five years of age, son of Dr. A. G. Williams, of Dongola, Illinois, was gored over the left eye by a cow, about two years before I saw him. The whole upper lid was torn from its attachments, with the exception of a narrow bridge at the outer end. The wound was dressed by the father, who reunited the severed integument quite accurately by sutures. Complete and accurate union of the skin was obtained, but with considerable irregularity of the conjunctival surface of the lid, and with complete ptosis. The eye was wholly uninjured.

I first saw the boy, in consultation with the father, March 15, 1871. The left upper lid appeared considerably thicker than the right, partially from an overlapping of the tarsal cartilage, which seemed to have been torn across about the middle of its length, and in part from a somewhat excessive quantity of subcutaneous adipose tissue just above the upper border of the cartilage. There was no sign of any action of the levator muscle in any of the movements of the eyes, but the lid hung motionless, except as it was lifted slightly by the contraction

of the occipito-frontal muscle drawing upon the skin. There was no impairment of vision, nor any restriction of any of the movements of the eye. The case was evidently one of complete detachment of the tendon of the levator, without other injury of importance. I decided to make an attempt to find the severed tendon, and reunite it to the tarsal cartilage. The operation was performed March 19th, with the important assistance of Dr. T. F. Prewitt.

An incision, of rather more than an inch in length, was made through the skin along the upper border of the lid, and the dissection extended through the subcutaneous fatty tissue in a direction nearly backward, so as to avoid opening the conjunctival sac. The upper surface of the eyeball was thus reached without having encountered any fibres of the orbicularis muscle, or in fact any other tissue than the subcutaneous fat, which was apparently continuous with the fat of the orbit. A broad, thin tendon was seen spread out over the exposed part of the globe, which proved to be the tendon of the superior rectus. Between this and the roof of the orbit the tendon of the levator was easily discovered, and no difficulty was experienced in attaching it, by three sutures, to the front of the tarsal cartilage. The wound was then closed by three other sutures, leaving the ends of the three deep sutures protruding externally.

The subsequent swelling was very moderate, and the external wound healed promptly without suppuration. The superficial sutures were removed on the fourth day, and the deep sutures left to become detached spontaneously. The boy was allowed to go home on the fifth day, the levator muscle evidently performing its function, although impeded in its action by the swelling of the lid.

Two months later the father wrote to me as follows:

"*May* 22, 1871.—The operation was a perfect success; the muscle united by first intention, and the eye opens and shuts simultaneously with the other."

ADDITIONAL NOTE UPON THE USE OF ATROPIA IN THE TREATMENT OF INCIPIENT STRABISMUS.

By John Green, M. D., St. Louis, Mo.

In the Transactions of this Society for 1870, I reported three cases of periodic convergent squint, in which the repeated instillation of atropia constituted an essential part of the treatment. The applicability of the method to the incipient stages of strabismus occurring in young children is my excuse for again briefly calling attention to the subject.

The conclusions at which I have arrived, as the result of another year's experience, may be briefly summed up as follows:

1. In even a very young child (in one case a child of three years), with commencing strabismus dependent on hypermetropia, the repeated instillation of atropia, to the point of completely suppressing accommodation, leads to the speedy abandonment of the habit of squinting, and the substitution for it of a kind of scowl, having for its object the exclusion of peripheric rays of light by the partially-closed lids.

2. The artificial amblyopia resulting from the total suspension of accommodation supplies a needed motive for the acceptance of convex glasses, which, in turn, by relaxing accommodation, tend to postpone the return of the deviation as the effect of the mydriatic passes off.

3. By repeating the instillation of atropia as often as signs of returning deviation appear, the habit of squinting may be effectually broken up, and the case at last brought fully under the control of convex glasses. This result is sometimes attained in the course of a month, but, in one case, of three years' standing, even at the end of eight months it was necessary still to resort to the atropia at intervals of from two to three weeks.

4. These results have been attained in three cases of periodic squint of fully three years' standing.

5. In cases of permanent deviation, in which parallelism of the visual axes no longer occurs even in perfect rest of the eyes, the effect of the treatment (whether atropia alone or atropia conjoined with glasses) has been confined to an improvement in the position of the eyes. In such cases, however, we have in the degree of the remaining squint an important index of the actual shortening of the interni, and a guide to the extent of the correction to be sought from tenotomy.

From these statements it will be seen that the success thus far attained by this plan of treatment is limited to the preservation of binocular vision through the wearing of convex glasses. This is, however, an advantage of no small importance, when we consider how rarely we are able to restore perfect binocular vision, after it has been once positively lost in consequence of the complete development of a squint. I am convinced that it is far better to arrest the deviation, and at the same time preserve binocular vision, than to sacrifice binocular vision and trust to a future tenotomy to cure the deformity. The danger of accidental injury from the wearing of glasses by a young child may be reduced to a minimum by making the frames strong, and of a somewhat flexible metal, like silver, and choosing the lenses of extra thickness as a safeguard against breaking.

PARALYSIS OF THE TRIGEMINUS, FOLLOWED BY SLOUGHING OF THE CORNEA. By Wm. F. Norris, M. D., Philadelphia.

W. McC., aged forty-two, horse-jockey, came to the clinic of the University of Pennsylvania, September 11, 1871, complaining of an inflammation of the left eye. The patient is pale and emaciated, and has a large epitheliomatous growth at the left angle of the mouth, which he says has existed for several months.

The left eye has been sore only one week, and the conjunctiva now presents a bright-red hue, but remains transparent and without granulations. There is slight bulbar chemosis and a punctated keratitis, most marked at the centre of the cornea, which renders it difficult to see the iris except at its periphery. It appears, however, to respond to the stimulus of light, and certainly dilates under atropine.

There is a slight drooping of the eyelid. The eye is mobile in all directions, but has lost its sensibility, and the cornea and conjunctiva may be touched without his evincing any consciousness of it. There is also impaired sensibility both in the skin and mucous membrane of the left side of the nose. The sense of taste seems also impaired, and salt placed on the left side of the tongue is much less promptly recognized than on the right. There is slight paresis of the left facial nerve, and marked deafness on the same side—does not hear a watch on contact, and a tuning-fork held at the vertex is heard only on the right side.

A solution of atropine was instilled into the eye, and a compress bandage applied so as completely to close the lids. This was removed twice daily, to cleanse the eye, and immediately reapplied to prevent the ingress of dust or other foreign

bodies. Notwithstanding these precautions, the inflammation of the cornea progressed, and a small slough formed at its centre, and separated. The minute aperture thus caused was blocked up by the iris, and subsequently showed as a central black spot.

September 20th.—He for the first time experienced a sensation of dizziness, and found that he could with difficulty walk straight. This feeling however, soon passed off, and up to date he has driven a pair of horses daily in the park.

October 15th.—He has been absent from the clinic and confined to the house for the last two weeks, owing to the tumor at the angle of the mouth becoming inflamed and ulcerated. During this interval he has had repeated attacks of dizziness, usually occurring in the afternoon, and causing him to stagger in walking. His gait is now habitually unsteady.

The limbus cornea above and below has become vascular, and next to it is a comparatively clear rim of corneal tissue, which is separated by a sharply-cut groove from the opaque central portion.

The right eye is healthy and emmetropic, $V = \frac{20}{XX}$.

October 15th.—The eye is more inflamed, and there is marked hypopyon.

October 20th.—There is less inflammation, and the pus in the anterior chamber has been absorbed.

On this day Dr. Garretson removed the epithelioma at the angle of the mouth, and the patient passed from my observation. Through his kindness I learn that on the 24th and 25th there was violent pain in the head, the patient crying out that "it would kill him." On the 26th the pain was still severe, but was more in the neck and cheek. From this date, although the attacks of pain were much less frequent, and his mind, which had been wandering, became more clear, the patient gradually grew weaker, and on the 21st November died. No autopsy was allowed.

The interest of the above-detailed case centres in the fact that, although the patient was seen at an early stage of the inflammation of the cornea, the most sedulous care in cleansing the eye and protecting it from external irritants, did not prevent the necrosis and perforation of the central portion of the cornea.

Inasmuch as the views of physiologists as to the influence of the trigeminus in the nutrition of the cornea are so diverse, it may be of interest to recapitulate the results of a few of the more prominent experimenters. Herbert Mayo [1] showed that section of the fifth nerve within the cranium produced insensibility of the eye. Charles Bell [2] recognized the fact that the sensibility of the eyeball was due to the fifth nerve, and maintained "that, when that sensibility is destroyed, although the motions of the eyelids remain, they are not made to close the eye, to wash and clear it, and, consequently, inflammation and destruction of that organ follow." Magendie [3] showed that section of the nerve in rabbits produced anæsthesia of the eye and inflammation and sloughing of the cornea. He, and after him, Longet, found that section of the nerve anterior to the ganglion of Gasser was more likely to produce this effect than section posterior to it. The latter [4] attributes the changes which take place in the eye to impaired nutrition, and argues that they cannot be due either to diminished secretion of tears or to the insensibility of the eye, because neither the more complete dryness of the ball, after extirpation of the lachrymal gland, nor the prolonged contact of the air in paralysis of the facial nerve, produces the same effects.

Graefe [5] experimented on rabbits, and found that intracranial section of the trigeminus caused insensibility of the ball, and complete opacity of the cornea, which in his experiments never went on to perforation. He maintained that the trigeminus is in part a trophic nerve, and that the destructive changes ensuing in the eye are not alone due to insensibility to external irritants, because extirpation of the tear-gland and cutting off both eyelids do not produce the same effect—the cornea remaining transparent. He also adduces pathological cases (in man) in which perforation of the cornea occurred.

Snellen [6] cut the trigeminus in rabbits, and found that, when he protected the eye, by sewing the yet sensitive ear

[1] Anatomical and Physiological Commentaries, Lond., 1822, No. II., p. 5.
[2] Nervous System of the Human Body, London, 1830, p. 207.
[3] Journal de Physiologie expérimentale, tome iv., pp. 176–183, 1824.
[4] Anatomie et Physiologie du Système Nerveux, t. ii., p. 161, Paris, 1842.
[5] Archiv. für Ophthalmologie, Band I., Abth. I., S. 306–315.
[6] Virchow's Archiv., 13 Bd., S. 107, 1858.

over it, the cornea remained intact for ten days, but that without this precaution it rapidly clouded. He has since published a case in a middle-aged man, where the eye improved when placed under a stenopaic shell, and the acuity of vision rose from $\frac{20}{CC}$ to $\frac{20}{XX}$. When the protection was removed it again sank to $\frac{20}{C}$, and immediately improved on its reapplication. He therefore argues that the changes in the cornea are traumatic, and not due to any trophic influence of the ganglion of Gasser.

Meisner[1] holds that the inner fibres of the nerve are more important than the outer for the preservation of the cornea, because, if the nerve be only partially divided and the former left intact, the cornea, although insensible, does not become opaque.

Schiff[2] arrived at much the same conclusions.

Finally, Sinitzin,[3] from experiments on rabbits, advances the following views:

1. That extirpation of the superior cervical ganglion of the sympathetic caused congestion of the choroid, and increased the temperature of the eye.

2. That the cornea in the operated side became more capable of resisting external irritants.

3. That, after cutting the trigeminus in front of the ganglion of Gasser, neuroparalytic affection of the cornea does not ensue, if the superior cervical ganglion of the sympathetic be at the same time extirpated.

4. That, after such changes have set in, they become retrograde, and disappear after extirpation of the ganglion.

5. That this is possible, so long as the cornea has not become dry and horny, and that even at this period it arrests further destruction.

6. That ulcerations of the lips and lids also disappear, and that, to allow repair to take place, it is not at all necessary to protect the eye.

[1] Henle and Pfeuffer's Zeitschrift (3), xxix., p. 96 (quoted by Wells).
[2] Ibidem, p. 217 (quoted by Wells).
[3] Centralblatt für Medicinischen Wissenschaften, No. 11, March 18, 1871.

A CASE OF CONGENITAL FISSURE OF THE LIDS. By W. W. Seely, M. D., Cincinnati.

Freaks in embryological development are interesting as curiosities, and instructive when studied in connection with the normal growth.

The case I have met with presented abnormalities in both lids, and also in the ball.

Beginning at the outer angle and following the lower lid toward the inner, we found the development perfect for about three-fourths of the length of the normal lid. Then, by a pretty steep angle of declension, the lid terminated with a channel, through which the tears flowed upon the cheek. The remaining fourth of the lid was found as a piece of skin, of an irregular, inverted V-shape, closely attached to the globe, extending to near the sclero-corneal junction.

The upper lid extended, with perfect development, to a point corresponding to the beginning of the defect in the lower. Here there was a slight notch; then the free margin was continued on to the inner angle, but without cilia, or Meibomian glands, so far as I could discover. There were, also, no cilia on the angle of termination in the lower lid, none upon the fold of skin attached to the globe. Nor were there any Meibomian glands in this attached portion, and no cartilage. There was likewise no trace of the inferior canaliculus.

Dr. Wecker has given a description of a case of congenital fissure of the lid (see *Arch. für Ophthal. und Otol.*, vol. i.), and has referred to nine others.

So far as I can discover, the case I have described is peculiar in this, that there was a very large portion of skin attached to the globe. This portion, however, did not fill up the defect

when the lids were closed, for a space was still left between the lid proper and the adherent portion. With the exception of this adhering part, the eyeball was perfect.

I have seen one case of slight notching of the upper lid, occurring in a child affected with single harelip. Also a dermoid tumor about the sclero-corneal junction, without any coloboma of the lids.

The child whose case I have described had a suspicion of defect in the upper lip, and also of the alveolar process. The lip seemed to be thinned in front of each nostril, the fact becoming quite apparent when the child cried and the lip was stretched.

According to Kölliker (*see* "Entwickelungs Geschichte des Menschen und der Höheren Thiere"), we have the sclerotic and cornea appearing in the latter part of the second and first part of the third months. The eyelids begin, as small folds of skin, about the first of the third month; come into contact and unite in the fourth.

It would seem, according to the pointing of some of these cases of defects, that, along with the formation of the lids, there must also take place a histological transformation of the skin covering the eyeball, into two layers of mucous membrane; the one, the palpebral, the other, the ocular conjunctiva.

Continuing our reasoning with this view, we are of course forced to regard these colobomata as simply arrests of histological transformation.

As regards the operative interference, I would simply add that the first step was to free the movements of the ball, which of course were very much restricted by the cuticular attachment. To accomplish this, I dissected the attached portion loose, down to a level with the *cul-de-sac*, and snipped it off. Then, by loosening the conjunctiva a little, and making two incisions along the *cul-de-sac*, on either side, it was readily brought together over the denuded spot and held by two sutures.

Two weeks later, I prepared the parts, denuding them up to the inner angle, also the lid, and, by making an incision horizontal to its free margin, carried it forward and fastened it.

It fitted nicely, and remained three days, when the mother brought the child in, saying she had torn the parts loose. Subsequent attempts failed to keep them together.

CONGENITAL ABSENCE OF BOTH EYEBALLS.

Two Cases. Reported by Dr. George Strawbridge, Philadelphia.

Through the kindness of Dr. George D. Townsend, of Norfolk, Virginia, I have in my possession a specimen, which is curious from the fact of there being complete absence of both eyeballs. The child lived thirty-eight days, and seemed in other respects to be a finely-developed child; its death resulted from an attack of cholera infantum, after a sickness of thirty-six hours. An examination of the specimen shows the lids to be well developed; but, instead of enclosing the eyeball, they end, as it were, in a *cul-de-sac*, which extends inwardly about $\frac{1}{3}''$, and terminates without a trace of the optic nerve being evident at its inner extremity. The lachrymal gland is found to be largely developed, while the bony depression for its reception is perhaps abnormally large. I am not able to find the presence of the puncta lachrymalia, or the canaliculi, although there would seem to have been an effort made toward the formation of a nasal duct.

There is a second case of similar character occurring in a boy living near Philadelphia, who is now seven years of age, and in other respects finely developed.

A third case, occurring in a child now three months old, which I, through the kindness of Dr. Levis, of Philadelphia, had the opportunity of seeing, showed congenital absence of one eyeball, while in other a large coloboma of the iris and choroid was found. The sources of information on this subject, so far as I have been able to obtain them, furnish very little light, either as to the probable cause, or as to the number of such cases on record.

How far maternal impressions may be relied on, as an influencing cause, in the creation of such monstrosities, I leave to other authorities better able than I to decide. In the third case, the mother attributed the misfortune to the fact that, during her fifth month of pregnancy, while engaged in chopping wood, a splinter struck her in the right eye with great force, producing a severe contusion, the effect of which lasted several weeks, and in her child at birth was found an entire absence of right eyeball.

ERRATA.

Transactions for 1870, p. 86, last line, for *image*, read *lens*,

Transactions for 1866, p. 25, tenth line from the bottom, for *the object*, read *this image considered as an object.*

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Total..... 7

Whole Number..... 68

DIAGNOSIS.

187

C H

Refraction. R. v. = Both. =

L. v. =

Accom. = Relative A. at in. = $\frac{+}{-}$

Muscles.

Adduction	at	in. =	: with vert. diplopia	at	in. =	°
" with	at	in. =	: with v. d. and	at	in. =	°
Abduction	at	in. =	: with vert. diplopia	at	ft. =	°
" with	at	in. =	: with v. d. and	at	ft. =	°
Linear deviation	at	in. =	lines :	at	ft. =	

Ophthalmoscope

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